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Original Articles

THE CLASSIFICATION OF SCHIZOPHRENIA

THE VIEWS OF KLEIST AND HIS CO-WORKERS

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A. INTRODUCTION

THIS is a summary of the views and findings of Professor Karl Kleist and his co-workers. It is based on a series of papers published by members of the Frankfort-am-Main University Psychiatric Clinic from 1939 to 1951.

These papers are the result of follow-up studies carried out on patients who had been admitted to the Frankfort Clinic between 1920 and 1953. These patients had been diagnosed as suffering from one of Kleist's special forms of schizophrenia.

Kleist believes that schizophrenia is an illness which finally produces a defect of personality and he excludes all schizophrenic illnesses which recover without defect. These are regarded as Degeneration Psychoses and their nomenclature is determined by the presenting symptom, so that one has Motility Psychoses, Confused Psychoses, Perplexed Signification Psychoses and so on.

For Kleist the schizophrenias are psychic system illnesses and correspond to the neurological system illnesses such as progressive muscular atrophy and hepatolenticular degeneration. The individual system illnesses of the nervous system are characterized by one or a few simple symptoms which are present throughout the whole course of the illness. These system illnesses can be shown to be due to degeneration of certain functionally organized parts of the nervous system and are, therefore, anatomical system illnesses. Kleist believes that in the psychic system illnesses one must look for nuclear symptoms which are due to the degeneration of definite isolated systems of the brain.

These views of course are shared by Kleist's collaborators, who were Professor K. Leonhard, W. Driest, Cl. Faust, E. Faust, G. Meyer, E. Neele and H. Schwab. In the course of this article mention will be made repeatedly of the Frankfort series of cases, and this will be done when reference is being made either to a paper of which Kleist was a co-author or to a paper published by one of his collaborators. Apart from the series of cases followed up by Kleist attempts to classify schizophrenias along similar lines have been made by Professor K. Leonhard, who has also collaborated with Kleist in follow-up studies on the Frankfort clinical material. Occasional reference is made in the papers under consideration to Leonhard's separate investigations, but no attempt is made here to summarize Leonhard's findings, which will be shortly appearing in book form. It should be pointed out that all the genetic investigations which will be referred to were carried out by Professor Leonhard.

Although Kleist makes a very detailed subdivision of the schizophrenias he takes pains to point out that his method of classification differs from that of Kraepelin in that Kleist's classification depends on signs of illness which are definite and easily understood. He criticizes Kraepelin because his classification depended on the severity and the extent of the morbid phenomena. Kleist insists that it is the type of the morbid phenomena which is important in classification.

Four main groups of schizophrenia are recognized by Kleist—catatonias, paranoid schizophrenias, confused schizophrenias and hebephrenias. It must be pointed out that the word confused applies to the speech and thought of the patient and does not mean that the patient is disorientated. There is no satisfactory word to convey the completely disordered speech and thought of these patients; perhaps the word muddled is the nearest English word for this.

In each main group of schizophrenia there are simple basic forms and atypical forms. The basic forms are for the most part distinguished by a few simple symptoms which are present throughout the whole course of the illness. These symptoms increase in severity and extent as the disease progresses.

The atypical forms were originally just those cases which could not be classified as simple forms. Later it was realized that there were two sorts of atypical cases. There were those atypical cases which could be regarded as combinations of two simple forms and those which could not. In the combined atypical forms one form may be dominant and merely coloured by the other form. On the other hand symptoms of both forms may be well expressed and may co-operate to produce symptoms not normally associated with either form. The atypical forms which could not be understood as combinations of two typical forms have been called atypical forms in the restricted sense. In these atypical forms the symptoms are due to disturbances in many psychic systems. Apart from this the symptoms often change or increase during the course of the illness, which indicates that fresh psychic systems are being involved. Because of this these atypical forms have been called extensive. Such extensive atypical forms were found by Kleist in catatonia, paranoid schizophrenia and confused schizophrenia, but not in hebephrenia.

B. Speech and Thought Disorder

It is necessary to understand Kleist's views on speech and thought disorder, before discussing the various subforms of schizophrenia. Thought disorder occurs to some degree in all schizophrenics, and in some forms of schizophrenia the type of speech and thought disorder may be characteristic.

Kleist distinguishes between thought disorder and speech disorder in schizophrenia. Other authors have denied the validity of such a distinction, but Kleist has pointed out that certain disorders of speech similar to aphasic disorders do occur in schizophrenia. Apart from this some patients with grossly disordered verbal productions behave in a reasonably ordered way which would not be expected if the speech was purely an expression of thought disorder.

1. DISORDERS OF THOUGHT

(a) *Incoherence*

In incoherence there is no relationship between one thought and the next. The patient is unable to maintain an aim of thought. Kleist believes that the organizing function of attention is disturbed.

Incoherence can occur at the height of flight of ideas because of rapid progress of thought and because of confusion. However, true or primary incoherence can occur which is independent of the tempo of thought and of diminution of awareness. Individual thoughts stand beside each other in an isolated manner, since no connection exists between them.

(b) *Paralogia*

This is a disorder in the finding of concepts which takes place in the preverbal stage of thinking. Kleist considers thought as having a sensory or receptor side and a motor or effector side. Paralogia is therefore a sensory thought disorder. The patient cannot present or define objects, persons, connections or events. He cannot give a correct account of the nature or significance of these things. Concepts emerge incompletely or allied concepts emerge instead of or in addition to the required concept. The concepts are thus mixed together. As the thinking by-passes the task of thought it can therefore be called paralogical.

Kleist believes that the neuropathological basis for the paralogical thought disorder is a lesion in the transitional area between the left occipital lobe and the third temporal convolution.

(c) *Alogia*

This is an inability to produce finished thought or a pure loss of thought. The patient is unable to form relations or to avail himself of acts of thought which have been accomplished. This disorder is not always easily distinguished from thought disorder due to defective motivation, akinesia, inattention or impairment of consciousness.

2. DISORDERS OF SPEECH

(a) *Paraphasia*

This is a mishandling of words or sounds; there are two types of paraphasia, literal and verbal. In literal paraphasia there is a derangement of the sequence of individual sounds, whereas in verbal paraphasia the words themselves are correctly formed but there is a faulty choice of words. A special or higher type of verbal paraphasia is found in the "secondary word formations". Here incorrect word derivations or word combinations are formed. This is one variety of neologism or new word formation.

Kleist points out that neologisms are not all due to the same kind of speech or thought disorder. Thus distortions due to literal paraphasia and contractions due to agrammatism may produce neologisms as well as verbal paraphasia. Some neologisms are technical terms used to designate complex delusional ideas. Other psychological phenomena may form the basis of neologisms. Thus some neologisms are verbal stereotypies, others may be due to the patient's attitude. An infantile attitude may lead to the production of diminutives, while a grandiose attitude may lead to the use of rare foreign words and odd phraseology.

Despite the views of other authors, Kleist is convinced that true speech disorder occurs in schizophrenia. In paraphasia there is a mishandling of words that produces sentences which at first sight appear to be senseless. However, if the paraphasic distortion is recognized then one can often realize that the sentence has a precise meaning. One can thus translate the ill-formed expressions into understandable language.

(b) *Agrammatism and Paragrammatism*

These are both disorders of word sequence. Agrammatism consists of a simplification and coarsening of word sequence. All the words which are not absolutely necessary may be left out. In severe cases only adjectives and nouns in the nominative, verbs in the infinitive and participles remain. Kleist believes that this disorder is due to a lesion in the frontal lobe.

Paragrammatism consists of an incorrect selection of expressions and sentences which are often mixed up and contaminated with one another. Verbal expression is not reduced and simplified but on the contrary it is complicated and abundant.

C. CATATONIAS

1. INTRODUCTION

These illnesses are considered to be due to disorders of the higher motor centres. Thus two forms of catatonia are thought to be due to disorders of motor centres just above the basal ganglia and the signs of these illnesses are not unlike those of Parkinsonism and Huntington's Chorea. The next four forms of catatonia are disorders of striving or tendency; they are therefore due to lesions of the subcortical motor centres. The last two forms are disorders of drive and due to lesions in the frontal lobes.

Kleist and Leonhard classify catatonias into eight forms which can be seen as four opposed pairs. In each of the pairs the disorder in one member is due to overactivity of the centre or psychological activity; while in the other member of the pair there is underactivity or loss of function.

The eight forms of catatonia originally isolated by Kleist were:

1. Akinetic (Rigid) Catatonia.
2. Parakinetic (Buffoonlike) Catatonia.
3. Stereotyped (Manneristic) Catatonia.
4. Iterative (Excited) Catatonia.
5. Negativistic Catatonia.
6. Prosectic Catatonia. (Now called Proskinetic Catatonia by Leonhard.)
7. Speech-prompt Catatonia.
8. Speech-inactive Catatonia.

After further investigation iterative catatonia was seen to be an atypical form. Signs of other forms occurred in iterative catatonia and it appeared to be an extensive atypical form. This was confirmed by the study of the course of the illness; new symptoms emerged from time to time and the course was markedly remittent.

Apart from the atypical extensive form atypical combined forms occur, where a typical form of catatonia may be combined with another typical form of catatonia or with another typical form of one of the other main groups of schizophrenia.

2. THE CLINICAL FEATURES OF THE ORIGINAL FORMS OF CATATONIA

(a) *Akinetic* (*Rigid*) *Catatonia*

The outstanding feature is impoverishment of movement which progresses rapidly to a complete and lasting akinesia. If movements occur, they are tentative and clumsy. The muscles may yield to passive movements or there may be a resistance which often gives way and is followed by co-operation. There is an increase in muscle tension but absolute rigidity does not occur. Negativism in the sense of a general active resistance to all attempts to influence the patient is not present. The patient may at times be persuaded to make movements. Waxy flexibility with automatic obedience may occur. Immobility may be interrupted at times by sudden impulsive movements. Parakinetic movements, stereotypies and iterative movements may occur at times, but are never very marked. When attempts are made to get patient to walk the legs are crossed over. The patient lies in bed with the head uplifted from the pillow, the legs adducted and the whole body drawn together. The absence of movements also expresses itself as absolute mutism. The face shows an absence of mimicry, the movements of the eyes and eyelids are restricted. The patients do not bother to feed themselves and are incontinent of urine and faeces.

Kleist compares the symptoms of the illness with those of the myostatic syndrome which occurs in encephalitis lethargica and paralysis agitans. He believes that they are due to a lesion of the centre responsible for psychokinetic impulses (*Regungen*).

This form of catatonia is rare and usually has a fatal outcome.

(b) *Parakinetic* (*Buffoon-like*) *Catatonia*

Here the leading symptoms consist of fragmentary movements which resemble those of chorea, athetosis and the tics. Although they look like involuntary movements they can always be imitated and are partly reminiscent of expressive and intentional movements. Phonetic parakinesias occur as clicking, snorting and hissing noises or the uttering of syllables and words with no meaning. Voluntary movements (including speech movements) are affected by the parakinesia so that a parakinetic dyskinesia occurs. The parakinetic movements show a limited amount of variation and there is a tendency to stereotypy. Episodes of akinesia, of general motor excitement or of isolated pressure of speech may occur.

Kleist believes that this illness is due to a disorder (in the sense of over-activity) of the centre for psychokinetic impulses (*Regungen*). This illness is not dangerous to life.

(c) *Stereotyped* (*Manneristic*) *Catatonia*

This is characterized by stereotypies and mannerisms. The mannerisms may be constantly repeated. As the illness proceeds an impoverishment of movement slowly occurs. Thought and speech disorders with paralogia and neologisms are found. Affect gradually declines. The illness runs a mild course and is relatively rare. Kleist considers it to be a disorder of striving or tendency (*Strebung*).

(d) *Iterative* (*Excited*) *Catatonia*

The leading symptom is iteration. This is a rhythmic repetition of movements and verbal utterances with a uniformity and restriction of content. The uniformity is not as marked as in stereotypy. Parakinesias occur as well as expressive movements and short circuit movements. These movements are not marked enough to colour the picture. Excited states occur and are followed by states in which very little movement is present. Because of these excited states the risk to life is greater than in stereotyped catatonia. The illness is, however, always frequently interrupted by complete or fairly good remissions. Signs of defect develop gradually and are not very marked. Kleist regards this illness as a disorder of striving or tendency.

(e) *Negativistic Catatonia*

Here there is an active striving against the outside world. If passive movements are attempted resistance to the movement increases to the same degree as the force used by the examiner. There is a general restriction of movement and any attempt to approach the patient produces active movements of withdrawal. Thus when the examiner proffers his hand the patient withdraws his. If the patient is approached he turns away or may run away. If the examiner persists in getting into contact with the patient then the patient strikes out. Any attempt to force the patient to do something leads to violent opposition. Apart from this sudden impulsive actions may occur. The course of the illness is steadily progressive and leads to a severe defect state. The risk to life is considerable. The illness is fairly common. Kleist regards this form as due to a disorder of striving or tendency and considers that the opposite form to it is prosectic catatonia.

(f) *Prosectic (proskinetic) Catatonia*

These patients turn towards the examiner. When looked at, nodded to, or spoken to they begin to whisper incomprehensible rubbish. The speech disorder can be summed up as verbigeration with pressure of speech. The facies are completely expressionless. Short-circuit motor excitements occur. The patients make quick movements and seize on to things. However, they easily give way. They can be pushed into doing those things which the examiner wants them to do. The seizing on to things may develop into a magnet reaction. The tendency to turn towards the examiner is compared by Kleist to the affirmation tendency of some organic patients.

(g) *Speech-prompt Catatonia*

Here the tendency to talk is outstanding. These patients are always ready to answer questions but they answer hastily, with no consideration and in a more or less senseless way. Thus *Vorbeireden* is present in which one can also recognize incoherence. The extent of paralogia in the *Vorbeireden* is difficult to assess. Agrammatical disorders are present and alogical defects can be demonstrated in tests of thinking. There is a verbal over-excitability and pressure of speech. General restlessness occurs and this may develop into excited states at times. Iterative, stereotyped and parakinetic movements occur. A general defect of drive is present and can be traced back a fair way in the previous course of the illness. As the illness proceeds verbal and general motor excitement decreases. Poverty of movement increases and akinetic phenomena may occur at the same time, such as Co-operation, Flexibilitas, Opposition and Dyskinesia. These occur more often than in the speech inactive form. The facies are expressionless and are in marked contrast to the readiness to talk. This form is considered to be a disorder of drive and is due to a combined disorder of the frontal lobes and the brain stem.

(h) *Speech-inactive Catatonia*

In this form there is a restriction of spontaneous speech. Patients look at the questioner but either do not answer or say very little. What speech there is consists of stereotyped remains of speech and agrammatisms. Alogical thought disorder is present and the content of thought is muddled. Auditory hallucinations are present but the content cannot be determined. There is a general defect of drive. Kleist compares this illness to Pick's Disease of the frontal lobes.

3. DIFFERENCES BETWEEN TYPICAL AND ATYPICAL CATATONIAS

All these illnesses end in more or less marked defect states. A steadily progressive course occurs in about two-thirds of all cases and remissions occur in a little more than a third of all cases. Complete remissions are rare and only appear in the first or second remission. Shifts of the illness usually last three to six months. The simple subforms with a few exceptions run a steadily progressive course. Two-thirds of the combined forms are steadily progressive. The iterative catatonias run a shift-like remitting course. The iterative excitement may pass into an akinetic phase and there may be a cyclic course reminiscent of circular psychoses. In the end states and remissions iteration is not clearly present and signs of psychomotor deficiency are prominent. In this case impoverishment of movement, absence of affect, and inactivity of thought with alogical thought defects are common.

Thus iterative catatonia is atypical in its symptomatology which extends beyond one psychological system. In addition its symptomatology varies during the course of the illness unlike that of the simple and combined forms which are relatively stable. Thus it is atypical in yet another way. Finally, the frequent remissions contrast with the more or less progressive course of the typical forms and this is yet another reason for calling iterative catatonia atypical.

In an attempt to explain the difference between typical and atypical forms Kleist and Leonhard postulate two factors in the production of the atypical forms. One factor is an inferiorly endowed system in the brain and the other is a toxic cause outside the nervous system. This latter could be endocrinological and its variation in strength would account for remissions and variations in the symptoms. Its additive effect on the defect in the nervous system would produce symptoms which would not be entirely confined to one system.

4. GENETICS

Kleist found genetic loading to be the least in the typical forms, more in the combined forms and most in the atypical forms.

In different typical forms there are different degrees of genetic loading. The parakinetic form is most heavily loaded. Kleist believes that iterative and parakinetic catatonias are inherited as Mendelian dominants and so probably are the other typical forms but penetrance is restricted.

5. GENERAL FEATURES

The previous personality was schizoid in two-thirds of Kleist's cases. Poor scholastic performance was common. The age of onset ranged from 15 to 41 years but it clustered between 21 and 25 years with a mean age of 25·3 years.

Ten years after the onset of the illness two-thirds of the patients in the series were dead; the death rate of the females was twice that of the males. Tuberculosis was the cause of death in 38 per cent. of the fatal cases.

D. PARANOID SCHIZOPHRENIAS

1. INTRODUCTION

Kleist regards paranoid schizophrenias as disorders affecting the concepts concerned with various spheres of the psyche. There is the allopsychic sphere in which concepts are found which deal with the relation of the ego to the world around it. Then there is the somatopsychic sphere in which concepts are found which deal with the relation of the mind to the body. Finally there is the autopsychic sphere in which concepts dealing with the attitude of the mind to itself, are found.

Different paranoid schizophrenias may affect concepts which are to be found in one or more of these three psychic spheres. Thus grandiose delusions concern the autopsyche while hypochondriacal delusions concern the somatopsyche.

Kleist has isolated seven typical forms. These are:

1. Phantasiophrenia.
2. Progressive Confabulosis.
3. Progressive Verbal Hallucinosis.
4. Progressive Somatopsychosis.
5. Progressive Autopsychosis.
6. Progressive Inspiration Psychosis.
7. Progressive Influence Psychosis.

As in the Catatonias atypical forms are found which are either combinations of typical forms or extensive atypical forms. The extensive atypical form of paranoid schizophrenia has been called by Kleist the Progressive Reference Psychosis.

2. INDIVIDUAL TYPICAL FORMS

(a) *Phantasiophrenia*

Morbid experiences in this illness have a fantastic colouring. The environment is changed in an almost fairy-tale like way. Memory falsifications and misidentifications occur. Patients have utterly senseless delusions which contradict ordinary common sense. Mass hallucinations occur, that is hallucinations indicating that mass activities are going on. Thus the patient hears the screams of many people being murdered. Hallucinations of bodily sensations are usually present but hallucinatory voices are not prominent. These patients behave fairly well but their drive diminishes as the illness proceeds. Thought is fairly well ordered and paralogia is not marked. The misuse of words and the occurrence of neologisms are very restricted. Affect is cheerful and lively in the early stages but it becomes blunted in the further course of the illness. Isolated catatonic phenomena may occur. This illness is fairly common; the Frankfort investigators found 13 cases in the series—9 females and 4 males. The average age of onset was 39·5 years. The pre-psychotic personality was abnormal in about two-thirds of cases and the school record was good in about two-thirds. The illness runs a progressive course but is not associated with an excessive mortality and death is usually due to old age.

(b) *Progressive Confabulosis*

The feature of this form is the presence of falsifications of memory. These occur in the form of connected accounts which are brought forward as personal experiences. All the ideas connected with the self are enriched and for the most part falsified in an expansive way. Fantastic changes of bodily sensation and of the external world are not prominent. These patients may present a more or less normal appearance for a long time. Thought is well ordered; paralogical and verbal disorders are even less than in Phantasiophrenia. Affectivity is fairly well preserved and the patient is energetic and industrious.

There were 5 cases in the Frankfort series; 2 male and 3 female. The average age of onset was 38·7 years but the onset was earlier in the males than in the females. The previous intelligence of these patients was good. The course was slowly progressive with no real remissions.

(c) *Progressive Verbal Hallucinosis*

There may be a prodromal stage which can be of three different kinds. An anxious depressive phase, a neurasthenic phase or a phase of self-reference. In most cases the hallucinatory voices begin suddenly and are accompanied by severe anxiety. This accounts for the frequency of suicidal attempts at the beginning of the illness. The voices are frequently recognized as morbid at the onset of the illness and they disturb the patient very much. Sometimes patients feel that they are being robbed, insulted or persecuted in some way. The content of the voices is closely connected with the patient's life. *Gedankenlautwerden* is very common. Elementary auditory hallucinations of noise such as buzzing and hissing occur. At times the voices are assumed to be coming from persons who are supposed to be present but at other times the voices are not related to the environment in this way. Sometimes the voices are attributed to the wireless or the telephone. Often the voices arise out of parts of the patient's own body. Sometimes the voices are derived from noises in the environment (so-called functional hallucinations). Other kinds of hallucination occur, most frequently visual hallucinations. Bodily sensations and hallucinations of smell and taste are found less often, and disappear in the further course of the illness. The patient's views of his environment change together with the sense deceptions. The illness is thus a progressive allopsychosis. The personality is well preserved and no deterioration of concepts concerned with the body or the self takes place. Drive and ability to work are preserved to a great extent. Isolated catatonic symptoms rarely occur and are transient. The Frankfort workers found 15 cases of this form; 11 women and 4 men. The average age of onset was 35·5 years. The pre-psychotic personalities were abnormal in two-thirds of cases, and the same proportion of cases were moderately well endowed intellectually. The course is nearly always progressive; only one patient had a remission. At follow up two-thirds of the patients were in an advanced defect state and one-third in a mild defect state. Only one patient died and death was due to tuberculosis.

(d) *Progressive (Hallucinatory) Somatopsychosis*

The chief symptoms in this form are hallucinations of bodily sensations and grotesque delusional formation concerning the body. In the milder form the bodily sensations dominate the picture while in the severe form the delusions are most prominent. Auditory hallucinations occur early in the illness but subside as it progresses. Visual hallucinations were only found in one case. Often the auditory hallucinations are prominent at the onset and the bodily sensations only come to dominate the picture as the illness progresses. Thus it may be difficult at the beginning of the illness to differentiate Somatopsychosis from Verbal Hallucinosis. Genital sensations are particularly prominent, especially in women, who often complain of being raped every night. Doctors and nurses may be blamed for this at times but devils and other supernatural agencies may also be blamed. Often the patient does not postulate a cause for the sensations or may be indefinite saying that the sensations are due to "them" or "people". Electricity, burning, stabbing and apparatuses may be claimed as the cause of the sensations.

The illness may begin with anxiety, suicidal attempts or experiences of reference and significance. These patients are tormented by their sensations and therefore become sullen, discontented and reproachful. Affective changes are present to some degree at the onset but become more marked in the later course of the illness. Outbursts of scolding occur. Some patients deteriorate markedly and lose their drive, activity and desire to work. Mild cases may be employable and even sometimes in positions of trust in the institution.

Fifteen cases occurred in the Frankfort series; 12 women and 3 men. The age of onset ranged from 30 to 54 years with an average age of 39·6. Not quite half of the patients had abnormal pre-psychotic personalities. Over one-half of the patients had good or very good intellectual endowments while one-fifth had poor endowments.

The course was interrupted by partial remissions in one-third of all cases but complete remissions did not occur.

(e) *Progressive (Expansive) Autopsychosis*

In this form ideas connected with the patient's own personality are affected by delusions. In some cases the clinical picture is an expansive one but in others the deterioration of the personality is so severe that the patient is confused about his own personality.

In the mild form sense deceptions and experiences of significance are only demonstrable in the early stages. The number and extent of the grandiose ideas become rather limited. However, the elevated pose remains unchanged. Claims of quite a different kind and value are expressed at the same time thus showing that there is a deterioration of concepts connected with the personality.

In the more severe form there is a more destructive disorder of the personality. Voices, bodily sensations are not pronounced and do not last for long.

The age of onset ranges from 21 to 41 years with an average age of 32·1 years. Kleist found 8 cases of this form in his series; 4 men and 4 women. Three patients had abnormal pre-psychotic personalities. Intelligence was very good in 7 cases.

The course is more often continuous than interrupted.

(f) *Progressive Inspiration Psychosis*

This form is distinguished by the occurrence of inspirations and is closely connected with the next form to be described which is distinguished by experiences of influence.

The inspiration is experienced as a terrific elevation into a state of grace or ecstasy. The mood is cheerful and the patient is ready and anxious to help and love his neighbour. Thoughts are alienated and experienced as inserted by divine, supernatural or cosmic forces. Ideas of self-reference may occur to a limited extent. Ideas of significance may also occur. Thought and speech disorder may be found in some cases.

The Frankfort workers found 3 cases of this kind. Their pre-psychotic personalities were described as erotic, sensitive and enterprising. The intelligence of these patients was good. The course was continuously progressive in one case and remissions occurred in the first year in the other two.

(g) *Progressive Influence Psychosis*

These patients feel that they are influenced in some way. Thought is felt to be influenced by others or withdrawn. Very little attempt is made to systematize the delusions. Bodily sensations are experienced. Ideas of self-reference occur. In some cases thought and speech disorders occur. The affect is suspicious, ill-humoured and irritated. The social attitude is very cool. The general attitude is that of a persecuted person protecting himself.

Only two cases were found in the Frankfort series and their pre-psychotic personalities were unsociable and nervous. In one case there was a remission in the first year, whereas in the other the course was continuously progressive.

The age of onset for all the cases of Progressive Inspiration and Progressive Influence Psychoses ranged from 27 to 40 years with an average age of 32·6 years.

3. GENETIC LOADING IN THE TYPICAL FORMS

The incidence of psychiatric illnesses in the families of patients suffering from the typical forms has been estimated by Leonhard. The incidence in the siblings of the hypochondriacal form was 6·2 per cent.; the verbal hallucinatory form 3·6 per cent.; the fantastic form 3·9 per cent.; the confabulatory form 1·7 per cent.; and the autopsychic expansive form 2·0 per cent. In all Leonhard's typical paranoid forms—excluding his incoherent schizophrenia—the incidence of schizophrenia was 3·3 per cent. among the siblings and 2·7 per cent. among the parents. Kleist considers that the inheritance in these forms is dominant with a restricted penetrance as there is no increase in the frequency of cousin marriages in his series.

4. COMBINED FORMS

Combinations of any two paranoid subforms can occur. The characteristics of one typical form may dominate and then the clinical picture may appear as a modification of this form. On the other hand combinations of two forms may lead to the strengthening of certain symptoms or the reciprocal modification of symptoms and thus new symptoms may appear.

In all Kleist found 24 cases with combined forms of paranoid schizophrenia. The following combinations occurred:

(*a*) Combinations of allied forms:
  I Phantasiophrenia and Progressive Confabulosis.
  II Progressive Verbal Hallucinosis and Progressive Hypochondriacal Hallucinosis.
  III Progressive Influence Psychosis and Progressive Inspiration Psychosis.

(*b*) Combinations of forms which are not allied:
  I Phantasiophrenia and Progressive Verbal Hallucinosis.
  II Phantasiophrenia and Progressive Somatopsychosis.
  III Progressive Confabulosis and Progressive Verbal Hallucinosis.
  IV Progressive Confabulosis and Progressive Somatopsychosis.
  V Progressive Verbal Hallucinosis and Progressive Autopsychosis.
  VI Progressive Somatopsychosis and Progressive Autopsychosis.
  VII Progressive Somatopsychosis and Progressive Inspiration Psychosis.

The average age of onset was 37·8 years in these cases as against 36·3 years for the simple forms. Not quite half of the patients were reasonably intelligent and rather more than a third were dull. The remainder were of average intelligence.

Just over two-thirds had a steadily progressive course whereas the rest had remissions at the beginning of the illness except in two cases where well-marked partial remissions occurred. In Leonhard's cases the course on the whole was progressive although in some cases it was acute with frequent variations.

Genetic loading was greater in the families of patients suffering from combined forms. Thus the frequency of schizophrenia in the siblings of combined forms was 7·1 per cent. as against 3·3 per cent. for the simple forms. The figures for schizophrenia among the parents were 3·6 per cent. and 2·7 per cent. respectively.

5. THE ATYPICAL EXTENSIVE FORM—THE PROGRESSIVE REFERENCE PSYCHOSIS

There is a mild and a severe form of progressive reference psychosis. The mild form consists of different admixtures of two sets of symptoms. One set of symptoms consists of marked ideas of self-reference associated with some experiences of significance. The other set consists of a circumscribed delusional formation and over-valued ideas. These sets of symptoms may occur separately or mixed together.

Sense deceptions are absent or insignificant. Experiences of influence are found sporadically. The delusions are persecutory in nature and grandiosity only develops occasionally.

Decay of conceptual thinking is only seen in isolated expressions in this illness. On the whole speech and thought disorders are slight. In two patients thought deterioration with a fantastic colouring was present. However, these cases were on the borderline of the more severe variety.

Drive and affectivity are not greatly changed. Where there is a circumscribed delusion the affective loading of the delusion is marked. Deterioration of the personality does not occur.

Kleist and his co-workers found 11 patients with this mild variety of the illness; 8 men and 3 women. The average age of onset was 35·5 years. The scholastic performances were good in all cases. Their occupational status was fairly good. The course of the illness was progressive in 7 cases but at times it was insidious so that one case was only admitted to hospital after 18 years. In three patients there were remissions in the early part of the illness. One patient improved enough in the late stages of the illness to be discharged from hospital.

The severe form of Progressive Reference Psychosis is characterized by a deterioration of the thought content which is coloured fantastically or influenced by hallucinations. However, these patients never show the complete development of Phantasiophrenia or an Hallucinosis. Severe thought and speech disorders also frequently occur. Mild catatonic signs may be present.

Many of these patients were originally diagnosed as atypical Phantasiophrenias or Progressive Hallucinoses. Kleist found 8 patients who began with ideas of self-reference, together with sense deceptions or a circumscribed delusional formation. Later on a deterioration of concepts with fantastic or hallucinatory colouring developed.

Kleist had 17 cases of the severe form of Progressive Reference Psychosis; 5 males and 12 females. In one-third of the cases the illness was variable and extensive remissions occurred. In a few cases affective variations occurred and a cyclic or periodic course was present. On the whole intellectual endowments were good or very good and were average or poor only in isolated cases. Schizoid pre-psychotic personality traits were found only in a minority of cases and a cheerful lively temperament or an anxious one was just as common. The age of onset ranged from 23 to 57 years with an average age of 40·5 years.

These 28 atypical cases can be classified according to their specific clinical features. Thus there were 14 Self-reference Psychoses, 6 Signification Psychoses and 8 Circumscribed Delusional Psychoses. These three forms are not variations of the same basic illness but each variety is a real basic form and has a different degree of severity and a different course.

(a) *Self-reference Psychosis*

In more than half the cases the illness was mild and in about two-thirds of the cases it ran a chronic course. In the rest there was only one full remission.

(b) *Signification Psychosis*

Here the course of the illness was usually severe; only in one case was it mild and that was a borderline one. The course was remitting or periodic in one-third of the cases. Females predominate but as the numbers were small the finding is of doubtful significance.

(c) *Circumscribed Delusional Psychoses*

A severe course of illness occurred in three-quarters of the cases. Nearly one-half had a remitting course or had affective variations.

(d) *General Points About the Three Atypical Forms*

These three basic atypical forms are related to each other and often combine with each other. However, they do not combine with the simple typical forms. The fantastic, confabulatory and hallucinatory symptoms which occur in the severe varieties of the atypical forms are phenomena associated with the general deterioration as are the very marked thought and speech disorders and the catatonic signs. They are not parts of the hallucinatory or fantastic syndromes which occur in the first four typical forms.

Since the illness extends into other psychic fields as it progresses, it can be called extensive. Thus there are three groups of forms of paranoid schizophrenia, typical, combined and extensive.

(e) *Genetics of the Extensive Forms*

Leonhard's figures for the incidence of schizophrenia in the parents and siblings of patients with the extensive forms is 34·6 per cent. and the figure of the incidence of schizophrenia anywhere in the family is 53·3 per cent.

6. RELATION OF PARANOID FORMS TO CATATONIA

In simple and combined forms of paranoid schizophrenia catatonic signs were sporadic and transitory. In the extensive forms catatonic signs were more frequent and more prominent. Mixed paranoid-catatonic combined forms were found.

E. Confused Schizophrenias

As pointed out before the word confused here is used to designate the muddled speech and thought which is a presenting symptom in this group. Two main groups can be delimited depending on whether the confusion affects mainly speech or mainly thinking. The following classification emerged on follow up of the confused schizophrenias.

- (1) Speech Confused Schizophrenias:
    - (*a*) Typical Schizophasia.
    - (*b*) Atypical Schizophasia.
        - I. Combined Forms.
        - II. Extensive Forms.
- (2) Thought Confused Schizophrenia:
    - (*a*) Incoherent Schizophrenia.
        - I. Simple (typical) Forms.
        - II. Combined Forms.
    - (*b*) Paralogical Schizophrenia.
        - I. Simple (typical) Forms.
        - II. Combined Forms.
    - (*c*) Atypical confused schizophrenia with a remitting course.

1. Schizophasia

(*a*) *Typical Form*

Three groups of symptoms are present at the onset of this illness. They are experiences of reference, grandiose ideas and sense deceptions.

Experiences of reference are partly those of self-reference, but experiences of significance and influence are more common. Occasionally experiences of inspiration occur. Ideas of persecution may therefore occur as a result of these various experiences and ideas. These ideas and experiences can be found in the later course of the illness but they become less prominent. At times they are only expressed fortuitously, may have to be asked for or even can only be deduced from the patient's talk.

Grandiose ideas of all kinds occurred in all patients in the Frankfort series except one: he was however haughty in his general attitude. Grandiose ideas were found in the later stages of the illness to the same extent as they were present at the onset.

The sense deceptions which occur are usually auditory hallucinations. They are phonemes and noises. Visions are also reported. The sense deceptions become less marked as the illness proceeds but in some cases they may cause excitements. Bodily complaints are made at times and appear to be based on bodily hallucinations. The severe speech confusion masks the hallucinations.

External behaviour depends on the type and intensity of the delusional and hallucinatory experiences. Hallucinatory voices tend to make the patients suspicious, irritable and inaccessible. As they diminish the behaviour becomes quieter and more orderly. Grandiose ideas are associated with an arrogant haughty attitude. No disorder of drive or impulse is found.

Thought disorder is present and consists of alogical defects and paralogical derailments. Nevertheless the behaviour is unobtrusive and regular useful work can be carried out. This indicates that the role of the thought disorder in the speech confusion is relatively restricted. The thought disorder does not affect the patient's performance but affects abstract logical thinking concerned with speech.

Speech disorder can usually be recognized at the onset and can always be brought to light with tests. Literal and verbal paraphasias occur and secondary word formation is common. Agrammatism and paragrammatism are present.

There is usually pressure of speech which increases when the patient is spoken to. Excited periods occur when the speech is more readily confused and these may be associated with an increase in the strength of the phonemes.

Seven typical Schizophasias occurred in the Frankfort series. The age of onset ranged from 24 to 44 years with an average of 32. Six patients had fair pre-psychotic personalities and one was a tramp. Two patients had blood relatives with psychiatric illnesses. The course was steadily progressive.

(b) *Atypical Forms of Schizophasia*

Here speech confusion of the schizophasic type is the chief symptom but other symptoms unlike those of the typical form are present. Thus sense deceptions may be prominent, psychomotor disorders may be present, somatopsychic changes may be severe and fantastic delusional formation may occur.

Seven combinations of schizophasia with other typical forms of schizophrenia were found. These were:

(I) Schizophasia and Schizophrenia in the restricted sense (incoherent paralogical schizophrenia) 3 cases.
(II) Schizophasia and Phantasiophrenia, 1 case.
(III) Schizophasia and Progressive Somatopsychosis, 1 case.
(IV) Schizophasia and Akinetic (rigid) Catatonia.

One case was an atypical extensive form and in another case no decision could be made.

The age of onset for the atypical forms ranged from 29 to 54 years. The scholastic performance ranged from very good to very bad. The course of the illness was progressive in 6 cases. Two exogenous psychoses, 4 undetermined psychoses and 4 definite schizophrenic psychoses were found among the relatives of the atypical forms.

2. INCOHERENT SCHIZOPHRENIA

(a) *Simple* (*Typical*) *Form of Incoherent Schizophrenia*

Self-references of a general kind occur at the onset. Ideas of persecution and injury occur. Grandiose ideas are rare. As the illness progresses these delusional formations become less marked and in the later stages are only expressed rarely. Probably the increasing confusion of thought does not allow the delusional experiences to be elaborated. Misidentifications are characteristic.

Hallucinatory voices occur at the onset and are very lively and disturbing. They mainly abuse and threaten the patient but they also say unimportant things. Elementary auditory hallucinations also occur. Hallucinatory voices continue throughout the further course of the illness and fluctuate in intensity. When they become intense excitements occur and recurrent attacks of excitement due to hallucinations are common. During excitements the patients shout abuse, threaten, are destructive and attack their environment. In quiet periods the voices cause the patient to talk to himself and also produce a state of aversion from the environment. Apart from hallucinatory voices other types of sense deceptions are rare and are not characteristic. Bodily hallucinations may occur.

Affectivity is changed. Some patients from the outset have an irritable declining attitude whereas others are anxious and perplexed. There is a rapid progressive blunting of affect. Violent affective outbursts of marked irritation occur. The mood state is usually a morose peevishness but may turn into a silly cheerfulness. A few patients were described as friendly, accessible and amenable for short periods.

In the initial stages short-lived stuporous states occurred associated with anxious excitements.

The nuclear symptoms are due to thought disorders. There is incoherence of the stream of thought and a disorder of perceptual thought with paralogical thought defects. Speech disorder of some degree is also present. These symptoms are all present at the onset but increase as the illness progresses until the patient's utterances can scarcely be understood at all.

Paralogical derailments and the mixing of concepts are the chief disorders of perceptual thought but alogical thought defects also occur. The deterioration of concepts affects the allopsychic sphere most frequently and severely. The verbal lapses are restricted; they are partly paraphasic and partly paragrammatical and agrammatical. Severe deterioration of verbal expression such as is present in Schizophasia does not occur.

Associated with the incoherence is an excitement and a disorder of attention. Thought is excited, words are abundant, pressure of speech and motor restlessness also occur. These patients swing rapidly from peaceful to excited behaviour. It is very difficult to persuade them into any form of regular activity. Their general incompetence is the chief point of distinction from Schizophasia.

Ten cases were found; 8 females and 2 males. The age of onset ranged from 18 to 52 years with an average age of 31·9 years. The scholastic performance where it was known was good or average except for two cases where it was bad. No particular pre-morbid personality was common. The family history was not known in two cases. In the rest there were psychoses and abnormal personalities among the blood relatives. In 4 cases a relative probably had a schizophrenic illness.

(b) *Combined Incoherent Schizophrenia*

Nine cases were found. These were:

(I) Incoherent Schizophrenia and Catatonia, 1 case.
(II) Incoherent Schizophrenia and Phantasiophrenia, 4 cases.
(III) Incoherent Schizophrenia and Progressive Confabulosis, 1 case.
(IV) Incoherent Schizophrenia and Progressive Somatopsychosis, 1 case.
(V) Incoherent Schizophrenia and Progressive Verbal Hallucinosis, 2 cases.

The incoherent-phantasiophrenia combined form was seen in some phantasiophrenias which were fantastic and paranoid at the onset but as they progressed deterioration of speech and conceptual thought appeared. These patients have pressure of speech and occasionally pass into excited states. They are idle and cannot be employed, unlike typical Phantasiophrenia where the patients are employable.

The age of onset in these combined forms ranged from 21 to 53 years with an average age of 34·4 years. Six patients were females and three males. Scholastic performance was good or average in 7 cases. In 5 cases the pre-psychotic personality was abnormal. The course was progressive in all cases.

3. PARALOGICAL SCHIZOPHRENIA

(a) *Typical Paralogical Schizophrenia*

The main feature is a paralogical thought disorder. Rare alogical defects occur but incoherence is absent. The paralogical disorder is seen in spontaneous utterances as well as in tests. There is a decay of concepts and the formation of new senseless concepts concerning the personality, the body and the external world. Absurd actions are carried out and these correspond with the paralogia. Thus one patient destroyed his ear drums with acid because deafness made Beethoven a genius.

The general validity of concepts is completely lost. The word no longer evokes the concept which belongs to it but evokes a completely different concept which may or may not be allied to it in some way. Neologisms emerge in order to denote new concepts but they are rapidly changed and disappear. Verbal paraphasias, faulty derivations and constructions of words are prominent. Agrammatical and paragrammatical mutilation of speech occurs. The patients speak deliberately without pressure of speech and are not usually averted by hallucinations.

Diffuse ideas of self-reference and damage occur early on and even at times clear fears of persecution or poisoning. Hallucinatory voices are a regular symptom whereas other sense deceptions are rare and transitory. As the illness progresses the delusional ideas are scarcely heard of any more, but the voices remain. The voices however do not dominate the picture nor do they cause aversion.

These patients do not participate in the activity which goes on around them and show marked poverty of drive. Their autism slowly increases but it is occasionally interrupted by an excitement due to hallucinations.

Six cases were found; 4 females and 2 males. The age of onset ranged from 18 to 52 years and the average age of onset was 30·5 years. Scholastic performance ranged from very good to moderate. Schizophrenia was found in blood relatives of one patient and a transient atypical paranoid psychosis occurred in another. The course of the illness was progressive in 4 cases and doubtful remissions occurred in 2 cases.

(b) *Combined Paralogical Schizophrenias*

Four cases of combined forms of paralogical schizophrenia were found. In 3 cases it was combined with a catatonic form and in one case with phantasiophrenia.

There were three females and one male. The age of onset ranged from 21 to 47 with an average age of 31·5 years. One patient had a mother with confused schizophrenia and another had an aunt with an involutional psychosis. The course of the illness was steadily progressive in all cases.

4. ATYPICAL CONFUSED SCHIZOPHRENIA WITH A REMITTING COURSE

These were originally called "incoherent excited" schizophrenias and are distinguished by the recurrence of fairly severe confused excitements. At the onset and during the early part of the course the diagnosis may vary considerably.

There are a great variety of clinical pictures which have characteristics of incoherent and paralogical schizophrenias. A hallucinatory delusional variety, an affective variety and a psychomotor variety can be differentiated. The hallucinatory delusional variety is characterized by paralogia whereas the other two are characterized by incoherence. Thought disorder is not as severe as in the typical incoherent and paralogical forms.

Five cases of this kind were found; 3 men and 2 women. Age of onset ranged from 23 to 44 years with an average of 30 years. Scholastic performance was average to bad. Pre-psychotic personalities were abnormal. Two patients had relatives in mental hospitals and 2 had parents who had committed suicide.

5. General Features of All Forms of Thought-Confused Schizophrenia

The course of the illness is commonly progressive in the simple and combined forms but always remitting in the extensive forms.

Females were three times as common as males in the typical and combined forms whereas 3 males and 2 females suffered from the extensive form.

The average age of onset in the extensive, simple and combined forms was 30 years, 31·9 years and 32·9 years respectively. The average age of onset for all thought-confused forms is 31·6 years which is lower than schizophasia (35·3 years) and paranoid schizophrenia (37·3 years) but is much higher than catatonia (25·3 years) and hebephrenia (22·9 years).

The pre-psychotic personality was autistic or sensitive in about one-half of the cases.

The genetic loading is more frequent in the extensive form but it is less in the combined forms than in the typical forms.

F. The Hebephrenias

Kleist regards hebephrenia as the variety of schizophrenia in which the affective deterioration is most marked. He classifies the hebephrenias as:

(1) *Typical Forms:*
  (*a*) Silly Hebephrenia.
  (*b*) Depressive (Eccentric) Hebephrenia.
  (*c*) Apathetic (Shallow) Hebephrenia.
  (*d*) Autistic Hebephrenia.

(2) *Combined Forms:*
  Kleist did not find any extensive atypical forms of hebephrenia.

1. Typical Forms

(a) *Silly Hebephrenia*

Here there is a marked affective and ethical flattening. The facial expression is affectless from the onset. These patients do not bother about their surroundings and do not make contact with others. They stand about or sit in corners and do not show any inclination to occupy themselves. They only work when supervised. This poverty of drive is associated with increasing poverty of words. Questions are answered mainly with "Yes" or "No" or "I don't know". Alogical thought disorder is present but paralogical derailments are very rare.

Silly behaviour is characteristic. At the onset there is unmotivated smiling or laughing. In men it is usually a silly smile, but in women it can be a noisy laughter, giggling or smirking. Later in the course of the illness the laughter does not occur spontaneously but only when the patient is spoken to or excited in some way. As well as this childish laughing there is a tendency to childish silly jokes and pranks.

There were 5 cases in the Frankfort series; 3 females and 2 males. The average age of onset was 20·6 years.

(b) *Depressive (Eccentric) Hebephrenia*

The illness begins with a more or less well-expressed depressive state. Suicidal attempts and suicidal ideas are common at the onset. As time goes on the depressive ideas and attitudes lose their affective depth and are less well held. The depressive mood becomes one of discontent. These patients are then querulous, complaining and full of grievances. They pass into irritated excitements for little or no reason.

Hypochondriacal complaints occur at the onset of the illness, are held on to throughout the illness and are brought forward monotonously in the same manner every time. This uniformity of expression produces an eccentric impression. Other eccentricities such as affected modes of speech occur. Peculiar stresses may be placed on words and a peculiar accent may be used.

These patients lose any real interest in their environment but they are always ready to criticize or to be maliciously insulting. They take reasonable care of themselves. Often they make pretentious requests and are haughty or presumptuous in manner.

Although there is some deficiency of drive they are loquacious, talkative and verbose. They are able to work hard and efficiently unless their hypochondriacal or irritated mood makes them discontented.

Hallucinations may occur at the onset but they do not affect the patients very much. Paranoid trends of thought play a more important role and may emerge in different ways.

Six cases occurred in the Frankfort series; 4 females and 2 males. The average age of onset was 22 years.

(c) *Apathetic (Shallow) Hebephrenia*

No characteristic symptoms occur at the onset and 5 of the Frankfort cases of this form were initially diagnosed as catatonia or paranoid schizophrenia. The leading symptom is a severe affective devastation which only becomes obvious after the illness has been present for some time.

Apart from this affective change, states of marked ill humour or excitement also occur. They are mainly irritated excitements but may be depressive or anxious excitements. They may be responsible for the patient's admission and for the initial diagnosis of catatonia. They continue throughout the course of the illness and alternate with quiet periods.

Delusional ideas and hallucinations are almost always associated with these excited states. Voices and bodily sensations are the chief varieties of hallucination. Sometimes these patients talk to themselves or scold softly.

On the whole they show little affect and are indifferent and uninterested. They often work well until interrupted by an excitement. In quiet periods they will often talk about ideas or hallucinations but these are discussed with little affect.

In three cases the excitements were extremely violent and two of the patients died from head injury sustained during an excitement.

There were 7 cases in Kleist's series; 4 females and 3 males. The average age of onset was 20·7 years.

The incidence of psychoses and psychopathic personalities in the families of patients with this form of illness was higher than in any other form.

(d) *Autistic Hebephrenia*

The clinical picture is not easy to recognize at the onset. Delusional formation occurs in all cases. Fear of poisoning is common and may lead to a refusal to eat. Hallucinations occur in all sensory fields and may cause anxious, irritated excited states. These patients may become violent, at times very violent, without any recognizable cause but usually the violence is related to the paranoid attitude of the patient.

As the illness progresses the patients become increasingly reticent about their hallucinations and delusions. Evidence of these then only emerges in the states of excitement and in the quiet periods they deny everything. They refuse to give any sort of information about their inner life and when questioned they show clearly their refusal to give adequate answers. This is in contrast to the apathetic hebephrenias who admit their hallucinations and accept the diagnosis of psychiatric illness with complete indifference.

Autism dominates the illness and these patients actively strive to shut themselves off completely from their surroundings. They do not bother about their environment at all. Their replies are not adequate and are usually monosyllabic or at times half-formed sentences. They object to being asked too many questions.

Affective blunting becomes more marked as the illness continues. The patients are inactive, they will not wash, they neglect themselves and prefer to lie in bed or sit dreaming to themselves in a corner. If admitted when the illness is well advanced they are often filthy and verminous.

Kleist found 6 cases of this form; 4 males and 2 females. The average age of onset was 28·3 years. The genetic loading with psychopathic and psychotics is lower than in the other three forms of hebephrenia.

2. Atypical Forms

Kleist found two cases of the apathetic-silly combined form. Leonhard found all possible combinations of the four forms.

Kleist's apathetic-silly combined forms showed affective devastation and ill-humoured or excited moods. However, silly behaviour occurred as well.

3. General Features

The average age of onset for the whole group was 22·9 years which is lower than that of the other three main groups of schizophrenia. The average age of onset of the autistic form (28·3 years) was much higher than that of the others and is in keeping with the marked paranoid element in this form.

12·5 per cent. of hebephrenias had a remitting course and 87·5 per cent. were steadily progressive. Some of the remissions were somewhat doubtful. In the 24 cases there were 11 males and 13 females. In the catatonias, confused schizophrenias and paranoid schizophrenias there was an excess of females who made up 59 per cent., 60 per cent. and 63·7 per cent. of the cases respectively.

No evidence about the pre-psychotic personality could be obtained in 8 cases. Thirteen patients had previous abnormal personalities. The level of intelligence was lower than in the other groups.

The genetic loading of 12·5 per cent. was found in the families but this included 2 doubtful cases. Schizoid psychopathy was very common and the incidence in the families was 83·3 per cent. The loading of the two combined apathetic-silly hebephrenias was greater than in the other forms.

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RAUWOLFIA ALKALOIDS AND RESERPINE IN THE TREATMENT OF THE CHRONIC PSYCHOTIC PATIENT

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REPORTS on the use of Rauwolfia alkaloids in the treatment of the mentally disturbed (Gupta *et al.*, 1943; Noce *et al.*, 1955) and on the remarkable central properties of this group of agents (Dasgupta *et al.*, 1953; Bein, 1955; Schneider, 1955) have encouraged a trial of the effect of both mixed Rauwolfia alkaloids, and of reserpine in the management and treatment of the chronic psychotic patient.

CLINICAL MATERIAL

The clinical material (Tables I and II) was drawn from two chronic female wards for disturbed patients, and falls into two groups. Group A consisted of

TABLE I

Group A. Patients Receiving Mixed Rauwolfia Alkaloids and Reserpine

Case No.	Age	Years in Hospital	Diagnosis	Clinical Response to Medication	Improvement First Noticed (Weeks from Beginning of Active Medication)	Further Improvement With Chlorpromazine	Change in Weight at End of Trial (lbs.)
1D	34	2	Affective psychosis	Much improved	5th week		+11
2D	22	2	Schizophrenia	Much improved	4th week		+6
3D	35	2+10	Schizophrenia	Much improved	5th week		+14
4	34	11	Schizophrenia	Definitely improved	2nd week	—	+23
5	36	2	Schizophrenia	Definitely improved	3rd week	+D	+15
6	58	3	Paraphrenia	Definitely improved	8th week	—	+11
7	59	25	Schizophrenia	Definitely improved	7th week	—	+9
8	22	$5+\frac{1}{2}$	Schizophrenia	Slightly improved	6th week	—	+8
9	25	6	Schizophrenia	Slightly improved	8th week	—	+6
10	65	3	Schizophrenia	Slightly improved	7th week	—	+5
11	33	4	Schizophrenia	Slightly improved	8th week	+	+11
12	29	6	Schizophrenia	Slightly improved	7th week	+D	+7
13	30	9	Schizophrenia	Slightly improved	8th week	+	0
14	37	12	Schizophrenia	Slightly improved	7th week	+	0
15	57	6	Paraphrenia	Slightly improved	5th week	—	0 (+6)*
16	47	10	Schizophrenia	Slightly improved	7th week	—	+5
17	42	7	Schizophrenia	Slightly improved	9th week	—	0
18	66	5	Senile dementia	Slightly improved	3rd week	—	+13
19	62	13	Paraphrenia	Slightly improved	14th week	—	0
20	33	11	Schizophrenia	Slightly improved	10th week	+	+19
21	51	13	Paraphrenia	Slightly improved	9th week	—	+6
22	44	8+2	Schizophrenia	Slightly improved	4th week	—	+10
23	46	15	Schizophrenia	Slightly improved	6th week	—	+5
24	54	23	Schizophrenia	Slightly improved	14th week	—	+12
25	58	28	Affective psychosis	Slightly improved	5th week	—	+14
26	40	20	Schizophrenia	Slightly improved	9th week	—	+14
27	54	27	Schizophrenia	Slightly improved	10th week	—	+6
28	71	6	Senile dementia	Not improved	—	—	0
29	57	10	Paraphrenia	Not improved	—	+D	0
30	33	10	Schizophrenia	Not improved	—	—	0

D Discharged.
* Figure in brackets denotes increase of weight due to oedema.
— No further improvement.
+ Improvement.

TABLE II

Group B. Patients Receiving Reserpine Only

Case No.	Age	Years in Hospital	Diagnosis	Clinical Response to Medication	Improvement First Noticed (Weeks from Beginning of Active Medication)	Further Improvement With Chlorpromazine	Change in Weight at End of Trial (lbs.)
1DR	27	1	Schizophrenia	Much improved	4th week		+13
2D	33	1+1	Schizophrenia	Much improved	5th week		+11
3DRD	39	2½	Paraphrenia	Much improved	2nd week		+8
4D	34	½+1	Affective psychosis	Definitely improved	7th week		+13
5D	34	2	Paraphrenia	Definitely improved	5th week		+11
6	64	2½	Paraphrenia	Definitely improved	4th week		+6
7DR	20	½+2	Schizophrenia	Definitely improved	8th week		+9
8D	49	3	Affective psychosis	Definitely improved	3rd week		+13
9	33	10	Schizophrenia	Definitely improved	5th week	–	+5
10DR	40	1½	Paraphrenia	Slightly improved	6th week	–	+13(+18)*
11	60	1	Psychosis with epilepsy	Slightly improved	5th week	+	+11
12	54	2	Paraphrenia	Slightly improved	3rd week	–	–9
13	32	2	Psychosis with epilepsy	Slightly improved	4th week	+	+15
14	44	3+1	Psychosis with epilepsy	Slightly improved	5th week	+D	+9
15	28	3	Schizophrenia	Slightly improved	7th week	+DRD	+10
16	34	1+½	Schizophrenia	Not improved	—	+D	0
17	58	7	Presenile dementia	Not improved	—	–	–7
18	60	15	Affective psychosis leucotomy	Not improved	—	–	0
19	45	4	Affective psychosis	Not improved	—	+	0
20	63	18	Paraphrenia	Not improved	—	+	–14

D Discharged.
R Readmitted.
* Figure in brackets denotes increase of weight due to oedema.
– No further improvement.
+ Improvement.

30 patients, all of whom, with the exception of 5, had been in hospital for over three years. Group B consisted of 20 patients; and of these 5 had been in hospital under two years, 9 between two and three years, and the remainder over three years. All patients included in this trial showed evidence of profound thought disorder, and were liable to periods of impulsive and aggressive behaviour. All were markedly disabled by their illness, had not responded to previous treatment, were unemployable, and, in the case of those more recently admitted, were thought to be of very poor prognosis.

DESIGN OF TRIAL, DOSAGE AND ASSESSMENT OF RESULTS

The design broadly followed the blind and self-controlled pattern used in a previous trial of chlorpromazine (Elkes and Elkes, 1954). All patients were observed in their own wards. They were individually known to the observers for many months or years, and slight and often misleading changes in behaviour could thus be given their due weight. Inert placebo and active preparations were alternated in the same patient, unknown to the patient, and to the medical and nursing staff. Daily notes were kept by the day and night nursing staff, and summarized in weekly reports. The patients were seen by their physician (C.E.) daily, and interviewed in some detail every fortnight.

The trial lasted for 43 weeks; and it was only at the end of it that a retrospective examination of the documents was begun, and an assessment of the outcome attempted.

All patients received placebo tablets for the first three weeks of the trial. *Group A* then received a course of a purified extract containing mixed Rauwolfia alkaloids (Rauwiloid, Riker*) 5 mg. daily for one week, followed by 15 mg. daily for 18 weeks. This was followed by placebo medication for 5 weeks, after which medication with reserpine (Riker, 1·5 mg. daily, rising to 3 mg.) was begun and continued for 17 weeks. This was continued after the formal trial had ended.

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* Rauwiloid 5 mg.≡Reserpine 1 mg.

Group B, after an initial 3 weeks on placebo, received reserpine (Riker), 1 mg. daily for one week, followed by 3 mg. daily for a further week; the dose then adopted varied according to the tolerance of the individual patient, and ranged between 3 mg. and 9 mg. per day. Parkinsonian symptoms (see below) were allowed to continue for up to 3 weeks before the dose was decreased. In view of the relapse observed in Group A when placebo was substituted for active medication, and the clear response (in terms of fall in pulse rate, blood pressure, and other side effects seen in Group B), no placebo substitution was carried out in this group.

In 6 patients (Cases 3, 6, 11, 12, 18, 20, Group B) who refused oral medication the drug was administered intramuscularly (Serpiloid, Riker, 1–4 mg. per day) for the first 1–3 weeks, followed by reserpine (1–3 mg.) by mouth. One patient (Case 6, Group B), consistently refused oral medication. This patient, after 7 months, continues to receive 2 mg. reserpine (Serpiloid) daily by injection.

In the responses grouped in Tables I and II, the term *slightly improved* is applied to those patients who as a result of medication became quieter, less aggressive, apparently less disturbed by their hallucinations and delusions, and subject to fewer impulsive outbursts. They became cleaner in their habits; where incontinence was a symptom, it diminished or ceased. Despite such superficial improvement, however, these patients were capable of little, if any, useful work in the ward, and made little contact with the nursing staff, their physician, or their relatives. Their improvement was superficial, symptomatic, and principally one in terms of management and nursing.

Patients included in the *definitely improved* group became strikingly more friendly and co-operative, although remaining affectively blunted. Delusions and hallucinations if present were not disturbing. They could follow an occupation steadily and with interest.

The patients *much improved* could be distinguished from the latter group inasmuch as they showed little residual evidence of psychotic thought disorder. The improvement had gone deeper, and had extended well beyond mere symptomatic and behavioural relief. All were discharged.

An important and notable aspect was the radical change in the ward atmosphere which developed as medication proceeded. There was a striking reduction of loud and abusive behaviour, of destructiveness and minor injuries, and a community feeling became apparent for the first time. No sedatives were needed while the patients were receiving reserpine.

RESULTS: RATE OF IMPROVEMENT AND RELAPSE

During the first two weeks of placebo medication some patients complained of fatigue, mild looseness of stools, and stated that the tablets were "too strong" for them. The staff, on the other hand, reported minor improvements daily. It was not until the fourth week that the new medication became a matter of routine, and that an atmosphere of healthy boredom supervened in the ward.

In Group A receiving mixed Rauwolfia alkaloids the improvement was slow to be noticed, and in 4 patients in the *much improved* and *definitely improved* grades (Cases 1, 3, 6 and 7, Group A) no improvement was reported until between the 5th and 8th week after starting active medication. Six patients in all grades (Cases 2, 3, 4, 11, 14 and 23, Group A) continued to improve steadily for 9 to 15 weeks after the response was first noted. Relapse on placebo medication was seen during the third to fifth week in all but four patients (Cases 1, 3, 6 and 7, Group A). This showed itself as an increase in overactivity, and aggressive behaviour, and an apparent activation of delusions and hallucinations which had been quiescent during the period of active medication. Five of the patients (Cases 4, 18, 23, 25 and 30) so treated relapsed badly and showed a striking return of the symptoms present at the beginning of the trial.

Of the four patients who did not relapse within five weeks, one (Case 6, Group A) was kept on placebo for 10 weeks and showed signs of relapse after 8 weeks. Another, a voluntary patient (Case 1, Group A) showed such improvement that she took her discharge before placebo tablets could be substituted. The third patient (Case 7, Group A) maintained improvement consistently for seven months after cessation of active medication before relapsing. The fourth patient (Case 3, Group A) was improved sufficiently and fit for discharge by the twenty-first week of the trial. Because of her home circumstances it was felt unjustifiable to risk a relapse by substituting placebo tablets. She has remained well at home for over a year, continuing to take 0·5 mg. reserpine daily, and attends regularly for follow-up interview.

The picture seen with Group B was somewhat different. During the first 3–4 weeks of active medication most patients (with the exception of Cases 2, 11, 15, 16, 19 and 20, Group B) became restless, and more, rather than less, of a nursing problem. It was originally thought that this change was an indication of too high an initial dose, and was to be avoided. In the light of further experience, however, it has now become clear that this overactive phase represents a most important period during the course of treatment. It is during this phase that patients become accessible, form contacts, and the foundation of a valuable psychotherapeutic relationship can be laid. Definite improvement was usually noted between the fifth and sixth week, and was maximal by about the tenth week. By this time the patients became quieter, less aggressive, and in those in whom marked improvement could be discerned, it was clearly manifest. It must be stressed that, in Group A, patients who had improved on mixed rauwolfia alkaloids showed no further improvement when given reserpine.

Eleven patients were discharged from hospital. Of these 3 belonged to Group A and 8 to Group B. Six cases (1, 2, 3, Group A; 1, 2, 3, Group B) belonged to the *much improved* and 5 to the *definitely improved* (Cases 4, 5, 7, 8, 9, Group B). Of the discharged *much improved* patients, 4 (Cases 1, 2, 3, Group A; Case 2, Group B) have remained out of hospital for a year or more, maintaining a good social adaptation while taking 0·5 mg. reserpine daily, and suffering no side effects. One patient (Case 3, Group B) discontinued her tablets after 2 months at home, relapsed badly and was readmitted. She is again well at home and continuing her medication. Another (Case 1, Group B), had a hostile mother and a very difficult home background; she stopped taking her tablets, relapsed and returned to hospital after 1 month. She has again responded to treatment but has not recovered fully enough to warrant discharge.

Of the discharged *definitely improved* patients two (Cases 4 and 8, Group B) continue with a maintenance dose and have stayed out of hospital for 7 and 9 months respectively. One (Case 5, Group B) is known to have stopped taking her tablets, relapsed somewhat, but is now tolerated at home by her family. The other (Case 7, Group B) who has no home, relapsed after a few weeks while on active medication, but has maintained her improvement after return to hospital. One patient (Case 10, Group B) was removed by her relatives against advice, stopped her medication, and was readmitted after three weeks. The maintenance dose of reserpine in these patients ranges from 0·5 to 1·5 mg. per day.

Two patients (Cases 18 and 19, Group B) definitely and progressively became worse as a result of reserpine medication. One (Case 18) had undergone a leucotomy for chronic melancholia 10 years earlier, and one was suffering from an affective psychosis. These patients became more withdrawn, underactive and depressed. One patient (Case 18, Group B) became actively suicidal. She improved when medication was withdrawn.

IMPROVEMENT IN RELATION TO AGE AND YEARS OF HOSPITALIZATION

TABLE III

Duration of Hospitalization in Relation to Degree of Improvement

Duration of Hospitalization	No Improvement	Slightly Improved	Definitely Improved	Much Improved	Total
Under 2 years	1	2	2	1	6
2–3 years ..	0	2	3	4	9
Over 3 years ..	7	22	5	1	35
	8	26	10	6	50

TABLE IV

Age of Patient in Relation to Degree of Improvement

Age of Patient	No Improvement	Slightly Improved	Definitely Improved	Much Improved	Total
20–30 years ..	0	5	1	2	8
31–45 years ..	3	9	5	4	21
46–60 years ..	3	9	3	0	15
Over 60 years ..	2	3	1	0	6
	8	26	10	6	50

As was to be expected the improvement rate was higher among the younger patients, and those who had been in hospital under three years. However, it is noteworthy how many of the long stay elderly patients benefited in some degree. For instance, out of the 35 patients who had been in hospital over three years only 7 failed to improve at all. Twenty-two showed *slight* improvement, 5 *definite* improvement and 1 was *much* improved (Case 3, Group A, who was discharged).

Eight patients under 30 all showed some improvement, but in four this was only slight. Twenty-one cases belonged to the 31–45 year age group. Of these 4 were *much*, 5 *definitely*, 9 *slightly* improved, and 3 showed no improvement. Of the remaining patients, 15 belonged to the 46 to 60 age group, and 6 were over 60. Their degrees of improvement had much the same distribution. None were *much* improved.

GAIN IN WEIGHT

Thirty-six out of 50 patients showed a consistent gain in weight, ranging from 5 to 25 pounds. This appeared to be due to improved eating habit. Two

TABLE V

Degree of Improvement in Relation to Gain in Weight

Change in Weight	No Improvement	Slightly Improved	Definitely Improved	Much Improved	Total
Gain	0	20	10	6	36
No change ..	6	5	0	0	11
Loss	2	1	0	0	3
	8	26	10	6	50

patients (Case 15, Group A; Case 10, Group B) showed a gain in weight related to the oedema which they exhibited; this, however, disappeared with a reduction of dosage.

SIDE EFFECTS

During the first two or three weeks of active medication a few patients in Group A (Cases 1, 6, 9, 10, 15, 19 and 28) receiving mixed rauwolfia alkaloids, complained of vague malaise and lethargy. The pulse rate, which was taken daily, varied, but in no case dropped below 48 even with relatively high doses. The maximum fall in the diastolic blood pressure reading recorded was 30 mm. Hg at a dose level of 15 mg. of mixed alkaloids. However, at no time were symptoms of orthostatic hypotension seen, or syncope observed. In none of these cases were there any manifestations of Parkinsonism whilst on mixed alkaloids.

In Group B, who were receiving reserpine only, it was fairly common for patients who were communicative enough (Cases 2, 3, 6, 7, 8, 12, 17, 18 and 20) to complain of lethargy, and of a feeling of "trembling" even on doses as low as 1 mg. daily. Eleven of the patients (Cases 1, 2, 4, 7, 9, 10, 11, 16, 17, 19 and 20, Group B) developed a striking Parkinsonian syndrome. This showed itself by tremor, salivation, shuffling gait, rigidity and a drawn mask-like facies. Five patients (Cases 8, 9 and 10, Group A; 4 and 9, Group B) receiving 9 mg. per day developed this syndrome within two weeks. The syndrome was reversible, and disappeared within 2–3 weeks with a reduction of the dose to 3 mg. per day level. Oedema of knees and ankles and finally eyes developed in two patients (Case 15, Group A; Case 10, Group B) and disappeared within three weeks upon reduction of dosage to the 1 mg. per day level. Nasal congestion was complained of by two patients.

COMBINATION OF CHLORPROMAZINE AND RESERPINE

After the end of the 43 weeks' formal trial, when it was felt that no further improvement in individual cases could be expected, chlorpromazine was added to the reserpine already being given. 3 mg. reserpine plus 150 mg. chlorpromazine were administered daily at first. Some signs of Parkinsonism were noted in most patients within 2 or 3 weeks. The dose was reduced, and a final maintenance dose of 1·5 mg. reserpine plus 75 mg. chlorpromazine per day was found both useful and tolerable. Fourteen out of the 38 patients thus treated showed some degree of further improvement.

COMMENT

The above results are encouraging and not out of keeping with the findings of others (Noce *et al.*, 1955; Kline and Stanley, 1955; Hollister *et al.*, 1955;

Hoffman and Konchegul, 1955; Foote, 1955). In Noce's series of 247 patients "27 per cent. treated with reserpine left hospital on indefinite leave of absence, or were discharged", and 36 per cent. were graded as definitely improved. Kline and Stanley, in their series of 150 patients, noted marked improvement in 32, and Hollister *et al.*, studying the effect of the drug in 127 chronic schizophrenics, report 22 as markedly improved. In Foote's series of 32 patients, 4 are reported as greatly, and 14 as much improved. On the other hand, Campden-Main and Wegielski (1955) were much less impressed by the effect of the drug, although, as they point out, the choice of their material presented special features.

In the above series, eleven out of fifty patients were thought fit for discharge, and eight, in fact, remained discharged at the end of the trial. Four relapsed after discontinuing medication, but one recovered again after resuming it. It may be argued that some of these patients could have undergone spontaneous remission during the relatively long period taken up by the trial. However, the criteria of choice of the original case material were severe enough, and the relapse on placebo in Group A, when seen, striking enough to attribute such recoveries as were seen principally to medication. Of the patients who did not relapse after 5 weeks, one relapsed after 8 weeks (Case 6, Group A), one did not relapse at all, and in the other two (Cases 1 and 3, Group A), for reasons given above, it was impossible or inadvisable to substitute placebo for the active preparation. It is, however, of interest that all these four patients belonged to the *much improved* and *definitely improved* grade. Coupled with the question of how much, in these patients, recovery was due to reserpine and how much to other factors, there is thus also the question whether cases showing a marked, relatively rapid and striking response do, in fact, depend upon a maintenance dose to the same extent as cases showing less dramatic recovery. A small maintenance dose (0·5 mg. daily) seems needed for those patients who respond to reserpine. Further studies in larger numbers will be required to determine the duration of this maintenance dose.

Of the 8 discharged patients, 5 (Cases 1, 2 and 3, Group A; 2 and 3, Group B) belonged to the *much improved*, and 3 (Cases 4, 5 and 8, Group B) to the *definitely improved* group. Seven of these (all but Case 5, Group B, who is known to have stopped her tablets, and to have relapsed) remain well after nine months from discharge, and receive a maintenance dose of between 0·5 and 1·5 mg. reserpine per day. One patient (Case 7, Group A), belonging to the *definitely improved* group, although showing little residual psychotic thought disorder, had been so completely institutionalized by 25 years' stay in hospital that it was found impossible to arrange for her discharge.

There is little doubt that in some degree 42 out of 50 patients benefited from the drug. This strangely high figure, which it was difficult to accept at first, is, of course, mainly accounted for by the large *slightly improved* group. The proportion, however, is not out of keeping with published data. Noce *et al.* (1955) in an uncontrolled study on 272 cases reported 15 per cent. of their material as not improved, and Kline and Stanley (1955) who studied 150 cases, 16 per cent. Zeller *et al.* (1956) (taking into account only their 92 psychotic cases) noted no improvement in 24 patients. The relief, though slight and superficial in the majority of cases, thus seems real. It will be seen from Tables I and II that most of the case material (27 out of 50 cases) were schizophrenics and that the *much improved* and *definitely improved* group included 10 schizophrenics. The drug was thus useful in schizophrenics. It is doubtful whether statistical analysis is warranted in the above limited case material. It is therefore omitted. It will, however, be seen from the Tables that most of the patients in the *definitely improved* and *much improved* group (12 out of 16) were under 45, and equally, that 10 out of 16 patients in the *definitely improved* and *much improved* group had been in hospital under three years. Nevertheless, equally significant is the high proportion (in the *slightly improved* group) of patients who had been in hospital over three years. In the *definitely improved* group also, 5 out of 10 had been in hospital for over three years. The drug thus affords symptomatic and slight relief to many chronic patients. Occasionally (for example Cases 3 and 7, Group A) it can lead to much improvement even in such chronic patients; though, generally it is the younger and more recently admitted who are liable to benefit most.

The effects of the drug were slow to develop, and at first showed themselves most obviously in the patients' demeanour in the ward. The overactive patients became, on the whole, quieter, more subdued, more co-operative, accessible and friendly as medication proceeded. Some patients underwent an initial, transient phase of overactivity and restlessness, and were more, rather than less, of a nursing problem. This effect, which was seen in Group B, receiving reserpine, and was less noticed in Group A, receiving Rauwolfia alkaloids, appears to be related to dosage, and is very different from that seen with chlorpromazine. It has been commented on in the literature (Barsa, quoted by Kline and Stanley, 1955) and would seem a most important phase in treatment, during which contact with the patient may be achieved, and the foundations of a valuable psychotherapeutic relationship laid; this can then be further developed as medication proceeds. It may also be during this phase that the patient, at first sporadically and transiently for very brief periods, and later in a much more sustained way, shows the first realization of her illness. However, it must be admitted that this phase is not essential, as it was mild or absent in Group A, although improvement equalled that of Group B. An equally important point, in agreement with the findings of Zeller *et al.* (1955) in their controlled study, is that it is only in the *much improved* group that a striking improvement in respect to ideation, as well as affect and behaviour, was seen. Not only is there, in this group, a change of attitude to hallucinatory and delusional material, and a falling off in overt aggression in the face of endogenous stimuli, but there is a steady diminution, to the point of extinction, of these manifestations with time, and an equally steady growth in the patient's power to grasp, to understand, and to form relations with others. Relatives repeatedly expressed their gratification at the way in which they could establish contact with patients whom they had considered hopelessly ill. It cannot be emphasized sufficiently that such improvement as is seen may take time. Thus, in 9 cases in the *much improved* and *definitely improved* groups, improvement was not first seen until the second month of active medication. It is therefore most important to persevere with treatment for at least this period, if not longer. Several authors (Noce *et al.*, 1955; Moore, 1956) have made this point. It must remain an open question whether it is wise to begin with a high dose and intensive treatment, deliberately inducing a Parkinsonian syndrome, and reducing the dose afterwards. The subjective sensations of the Parkinsonian state are disturbing and unpleasant to the patient, and it would seem unnecessary at this stage of our knowledge to submit the patient to a temporary extrapyramidal syndrome by means of a drug, the effects of which so obviously take time. No Parkinsonian syndrome was encountered in Group A, in whom the maximum dose was 15 mg. of mixed alkaloids. In Group B the syndrome was seen in 11 patients who received 6–9 mg. per day. Irrespective of such effects, and the appearance or non-appearance of the overactive phase, the ultimate effect of reserpine should be measured in months rather than weeks. Again, patients who have been chronically institutionalized and ill for a very long time, must be given time to adjust to the extent of the change in themselves. This aim, in the first instance, is better served by maintaining moderate doses for a long time, rather than high doses for a short time, where rapid response to treatment is not the first consideration.

There is a further reason for continuing a trial for long periods. The subjective view of the observers must be taken into account. This is usually considered to be in favour of a new drug; but it has been found repeatedly that observers over-compensate for their bias, and assume an attitude of scepticism in the face of evidence to the contrary. A "blind" design of trial is insufficient, unless it is linked to a long and continuous period of observation during which any unevenness in observer-error, and spontaneous fluctuation in the clinical picture, may play itself out. This was also the experience in a previous trial with chlorpromazine (Elkes and Elkes, 1954).

Various authors (Kline and Stanley, 1955; Hoffman and Konchegul, 1955) have commented on the striking change in ward atmosphere. This is certainly very true; and although reflecting perhaps the most superficial, i.e. behavioural, aspect of improvement in the individual patient, the effect on patients as a group is considerable, and offers novel, and as yet unexplored opportunities for group therapy in the chronic ward.

The side effects of reserpine were not unduly alarming, and, against expectation, the hypotensive effects gave little trouble in schizophrenic patients. On a dose of 3 mg. reserpine the maximum drop encountered in the diastolic reading was of the order of 30 mg. Hg, and the lowest pulse rate recorded was 48. Yet the patients complained of no giddiness, and no orthostatic reaction, or syncope were ever observed. The symptom of Parkinsonism, though clearly due to overdosage, and readily reversible, can hardly be classed as a side effect. The peculiar oedema seen with reserpine in two cases has also been described by others (Zeller *et al.*, 1955). A battery of renal and liver function tests gave no clue to its aetiology, and for the present this must remain indeterminate. Two patients (Cases 18 and 19, Group B) showed marked depressive features while receiving reserpine. The exacerbation or appearance of depression following reserpine therapy has, of course, been observed in hypertensives (Müller *et al.*, 1955; Achor *et al.*, 1955; Smirk and McQueen, 1955), and Davies and Shepherd (1955) have reported a lack of response to reserpine in patients showing severe depression. The presence of depressive features in our view forms a contra-indication for reserpine therapy. Nasal congestion was seen in two patients, but was a transient symptom which does not call for detailed comment.

Most patients who benefited from reserpine medication put on weight, though this increase was not as marked as was seen with chlorpromazine (Elkes and Elkes, 1954). This increase in weight has been observed both in psychotics (Foote, 1955) and in hypertensives (Müller *et al.*, 1955). In the absence of further evidence it is fair to attribute this to improved eating habit in previously tense and pre-occupied individuals. The effect in hypertensives is less easy to understand. In any event, a direct metabolic effect cannot be excluded.

Fourteen out of 38 cases in whom the response to reserpine had been limited, improved when chlorpromazine was added to reserpine. Such synergism between the two drugs has been reported (Barsa and Kline, 1955; Morgan, 1955). The synergism also applies in regard to toxic manifestations of the drug.

If reserpine was given in doses insufficient to produce Parkinsonism the addition of chlorpromazine led to the appearance of this syndrome.

The introduction of reserpine adds a new and powerful tool to the management, treatment and investigation of chronic mental disorder. As yet, one is at a stage which can fairly be compared to the very early days of leucotomy. The precise indications for therapy with chlorpromazine and reserpine, used singly or in combination with each other and with related, or chemically unrelated compounds, are only dimly apparent, and cannot be defined except by multiple, independent, carefully planned long-term studies where early results can be viewed against the perspective of long-term follow-up. These advances are inseparable from advances not only of detailed knowledge of the clinical action, but also an understanding of the mode of action of these drugs. The full therapeutic effects, when first seen, are striking. Equally remarkable, however, are such undesirable effects as the ability to induce depression in moderate doses, and the Parkinsonian syndrome in high doses. Such actions may be helpful in defining the biochemical and neurohumoral background of the disorders they bring about, as well as those they relieve. From that point of view, as well as in respect to the relationship of reserpine to the storage and release of serotonin (Pletscher, 1955) the interest of reserpine far surpasses a mere clinical interest. And it may well be that biochemical and pharmacological data in man will, in time, provide objective criteria for the selective use of these drugs in the individual patient.

SUMMARY

1. The effect of a preparation of mixed Rauwolfia alkaloids, and of Reserpine has been studied in 50 chronic psychotic patients of poor prognosis. Inert placebo, and the active preparation were alternated in 30 of the patients. The trial lasted for 43 weeks.

2. Six patients were graded as much improved and ten as definitely improved. The much improved group showed little evidence of residual thought disorder. Eight patients were discharged. Of these, four have remained out of hospital for one year after the end of the trial, and two for seven and nine months respectively. A small maintenance dose of Reserpine (0·5–1·5 mg. per day) is indicated in these patients.

3. Twenty-six patients were graded slightly improved. The improvement here was superficial, and principally one in terms of overt behaviour. The psychotic process remained essentially unchanged.

4. The transient overactive phase seen during the second to fifth week of reserpine medication is noted. It may afford an opportunity for establishing a therapeutic relationship with previously inaccessible patients. The phase was not always observed in those patients who received low doses.

5. A Parkinsonian syndrome was seen in eleven patients receiving reserpine. The high dosage leading to the syndrome is not considered essential for therapeutic success. Long-term treatment, however, is essential.

6. The change in ward atmosphere brought about by reserpine is striking, and offers novel opportunities for group work with chronic patients.

7. At the end of the formal trial, chlorpromazine was added to reserpine in 38 cases. Fourteen of these showed further improvement.

8. The value of reserpine as a tool for investigation as well as therapy is stressed.

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SIZE CONSTANCY IN SCHIZOPHRENIC PATIENTS*

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INTRODUCTION

(*A*) *Size Constancy*

CONSTANCY of perception is one of the basic mechanisms of adjustment to the environment. It allows the subject to perceive stable objects in the external world instead of ever-changing flux of stimulation. It maintains the perceived environment within wide limits constant, thus it is a homeostatic mechanism of great importance for the biologic adaptation of the organism. Constancy of perception includes constancy of size. When the distance between an observer and an object changes Size Constancy allows him to perceive the object as being within wide limits, the same size in spite of the fact that the size of its retinal image varies in direct proportion to the distance according to the equation $a=\frac{A}{D}$. (In this equation "a"—is the size of the retinal image, "A"—is the size of the object and "D"—is the distance of the object from the observer.)

Extensive studies of size constancy in normal people have been carried out by Brunswik (2, 3), Holway (9) and Gibson (6). They have demonstrated that the "apparent" or phenomenal size of a perceived object is represented neither by the retinal stimulus nor by the real object, but is generally intermediate between the two, being much nearer the size of the real object. The cue provided by the retinal image size is integrated with the cues provided by the whole visual field, such as spatial relationships with other objects (2), natural gradients of texture (6), and the cues provided by the "set" of the perceiving organism, such as changes in ocular convergence, binocular parallax and head movement parallax. As a result a "Gestalt" or invariance is obtained, which remains constant although the constituents may change. (A retinal image of a certain size is interpreted either as produced by a small object at a short distance or a large object at a long distance, depending on the significance attached to the various other cues.)

According to Hilgard (7) and Gellhorn (5), in this process past experience and learning play an important role, although the inborn mechanism seems to be equally important. Brunswik (3) and Holaday (8) have found that in perception, the organism's orientation or "intention" is toward the "real" object, and it is only when other cues are greatly reduced, or when the subject assumes a highly sophisticated experimental attitude that a phenomenal percept can approach the stimulus value—the size of the retinal image. In the experiments with the constancy of perception, we are dealing not with the "apparent" or "phenomenal" size, but with the "judged size", by which is meant the physical size of a comparison object judged to be equal to the standard. It is usually assumed that the "judged size" is directly influenced by the "phenomenal size". This assumption is correct only up to a point, as we are capable of judging correctly the size of familiar objects at a great distance in spite of the fact that these objects look small. This differentiation has to be borne in mind in all the interpretations of the results of the experiments with the size constancy. However, in case of unfamiliar objects, this differentiation is less important.

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* Saskatchewan Committee on Schizophrenia Research.

(*B*) *Size Constancy in Schizophrenia*

Schizophrenia is a severe mental illness which leads to a profound disorganization of behaviour, thought process and perception (illusions and hallucinations). The latter occur in spite of the fact that the function of the sensory organs is normal, and it has to be attributed to the disorder of some higher central processes. In psychodynamic terms, schizophrenia has been described as a "regression to primary narcissism", a withdrawal from object relationships, and an increasing concern for the self (Fenichel, 4). Whatever the interpretation, whether physiological or psychological, it is possible that in schizophrenia, constancy of perception breaks down and that this leads to the perplexity, feeling of change, and strangeness of the world which they experience, particularly in the early phases of their illness (Bruner, 1).

G. A. Reynolds (13), in an unpublished Ph.D. Thesis, investigated size constancy for familiar objects (playing cards) and unfamiliar objects (plain cards) in three groups of schizophrenics (paranoid, catatonic and hebephrenic), and one group of normals. The schizophrenics were in a state of remission, and were not suffering from active symptoms. The subjects were asked to make verbal assessments in inches of the sizes of the cards and their distances.

He found that the distance and the size taken separately did not differentiate between the normals and schizophrenics, but the apparent visual angle (the distance and the size combined) differentiated between these two groups. In schizophrenics, the constancy of perception was better (apparent visual angle changed less). He further found that in the normals, constancy of perception was better for the familiar objects (playing cards) than for the unfamiliar objects (plain cards), the reverse held for schizophrenics.

He interpreted the results as due to the fact that the schizophrenics were less anxious than the normals during the experiment, and that they operated on the basis of some consistent "personality attitude", which was absent in the normals. This attitude was "the negative cultural attitude", which produced a greater constancy in schizophrenics for unfamiliar objects (plain cards) than for familiar objects (playing cards).

H. L. Raush (11) suggested that schizophrenics, as far as the constancy of perception was concerned, are not a homogeneous group. He assumed the existence of a polarity, typified at one end by paranoid schizophrenics with well preserved, rather rigid personalities, systematized delusions, and little thought disorder, and at the other end by hebephrenic schizophrenics with disorganized personalities, profound disorder of thought, and fleeting, bizarre delusions and hallucinations. The schizophrenics belonging to the first group (approaching the first pole) would be characterized by a higher degree of constancy of perception than normals. The schizophrenics belonging to the second group (approaching the second pole) would show breakdown of constancy of perception.

To test this hypothesis, he compared the size constancy in a group of normals, a group of paranoid schizophrenics, and a group of other schizophrenics than paranoid, who were not, however, deteriorated. Each subject had to adjust the size of the luminous circle 4 feet in front of him to the size of the standard luminous circle 20 feet away. Two sets of experiments were performed, the first set in the darkened room, where there was a poverty of distance cues, and the second set in the well-lit room, where there was an abundance of distance cues. He demonstrated that paranoid schizophrenics differed significantly from both normals and non-paranoid schizophrenics in the direction of increased size constancy (over-constancy) under two different experimental conditions. The difference was greater when the room was darkened, while there was no significant difference between the normals and the non-paranoid schizophrenics under the two conditions. He interprets the increased size constancy (over-constancy) in paranoid schizophrenics as due to the existence of a compensatory mechanism which imposes a rigid order on an environment which has become ambiguous and threatening. This was clearly shown by the fact that over-constancy was higher when the room was darkened and there were fewer cues.

In a second paper, H. L. Raush (12) has demonstrated that symbolic value of an object (such as positive affective value of an ice cream scoop, as compared with what he considered a neutral affective value of an ordinary overcoat button) has a greater influence on size judgments made by schizophrenic patients than on those made by controls in the direction of over-estimation of the size of an affectively valued object. Further, he has demonstrated that the paranoid schizophrenics show greater constriction in their judgment as to the range of a concept than do controls and non-paranoid schizophrenics. Thus, paranoid schizophrenics showed higher constancy, but also a higher rigidity and less flexibility than both normals and non-paranoid schizophrenics.

Hypothesis

This paper reports an experiment which was set to test the following hypothesis:

> Chronic schizophrenics with some personality deterioration and thought process disorder show diminished size constancy of perception when compared with normal controls and non-schizophrenic mental patients.

The Samples

Three groups were used—32 schizophrenics, 32 normals and 32 non-schizophrenic mental patients.

The Schizophrenic Sample included only patients in whom the diagnosis of schizophrenia had been firmly established by all the psychiatrists who had examined them. It consisted of 11 females and 21 males. Nine patients were originally diagnosed as paranoid schizophrenics, 14 as hebephrenic schizophrenics, 4 as simple schizophrenics, and 5 as catatonic schizophrenics. However, the clinical picture at the time of the experiment in almost all the patients was that of hebephrenic schizophrenia, or a mixture of hebephrenic schizophrenia and simple schizophrenia features.

The mean age of the patients was 36 years (S.D.=6·7 years). The average length of stay in the hospital was 7 years, 9 months (S.D.=5·8 years). No patient in whose case there was a possibility of mental deficiency or organic brain disease was included. No patient undergoing insulin or electrical shock treatment was included. Only the patients in whom a satisfactory co-operation during the experiment could be obtained were included in the sample. Thirty patients had visual acuity of 20/20 corrected or uncorrected. Two patients had 30/20 vision.

The normal sample included 32 volunteers from the hospital staff, 10 females and 22 males.

Their mean age was 27 years (S.D.=7·1 years).

The normal subjects were told to bring their glasses if they were using them; otherwise, visual acuity was assumed to be about 20/20.

The non-schizophrenic patient sample consisted of 18 females and 14 males. Their mean age was 43 years (S.D.=10·9 years). The average length of stay in the hospital 8 months (S.D.=21·4 months). They also had their visual acuity controlled. Their diagnoses were: Mania (remission)—2; Reactive Depression—5; Depression (endogenous)—7; Anxiety State—2; Alcoholism —9; Character Neurosis—2; Drug Addiction—3; Psychopathic Personality—1; Hysteria—1. No epileptics, mental defectives, or patients with an organic brain disease were included. There is discrepancy in the mean ages of the samples; however, it can be disregarded, because H. L. Raush (11) in his study could not find any consistent evidence of relationship between age and constancy score. Moreover, the mean age of the schizophrenic group falls between the mean ages of the two control groups, so unless we assume a curvilinear relationship, the factor of age is controlled.

Apparatus

The apparatus consisted of a white-painted box, standing on a white-painted table with a white screen behind it. There was a black rod (0·5 cm. in diameter) on the top of the box, which could be adjusted to different heights (0–20 cm.) from behind the screen. Another white screen in front of the box could be removed and put back again.

There was another white table, of the same size and shape as the first table to which was attached a white box the same size and shape as the first box with a black rod which could be adjusted to different heights (0–20 cm.) by pushing a handle behind the box. On the other side of the table was fixed a chin support.

Procedure

A long corridor was used, which was lit with electric light. All external light was carefully excluded. Care was taken to maintain a standard arrangement of objects so that the cues would not change. The subject was sitting behind the second table with his chin on the chin support, and his hand on the handle for adjusting the rod on the top of the box 44 cm. in front of him. The other table was placed at a distance from the subject. Two distances were used for each subject—first 7·5 m., second 15 m. The experimenter sat behind the screen. The subject was told to adjust the black rod on the top of the white box in front of him to the same size as the other black rod, which he saw at a distance. He was instructed to use both eyes, and not to use sighting. He was asked to use his first impression. When making a new adjustment, he was not allowed to go back to zero, but had to make it from the existing position. (The standard instruction was read to the subject.)

The experimenter showed the following sizes in the standard order of: 10, 15, 5, 11, 6, 18, 2, 14, 7, 20, 4, 17, 1, 13, 3, 19, 8, 16, 9, 12 cm. from the distance of 7·5 m., and 7, 20, 2, 18, 6, 11, 5, 15, 10, 16, 9, 12, 8, 19, 3, 13, 1, 17, 4, 14 cm. from the distance of 15 m. Each time the size of the rod was being changed, the white screen was put in front of the box, thus preventing the patient from seeing the movement of the rod.

The adjustments of the rod made by the patient were read and recorded by an assistant. (The patient could not see the actual measurements.) Each adjustment was recorded in centimetres as an error, either plus or minus from the standard size displayed to the subject from the distance. (The accuracy was to one decimal point.) These errors were added up, and the average error was calculated, which became the score of each subject.

"Series effect" had to be taken into consideration in using a series of different sizes as stimuli. It was hoped that this tendency to regress to the mean size of the series would be counteracted by displaying alternately large and small sizes, which by introducing the contrast phenomenon would act in the opposite direction. The instruction to adjust the rod from the previous position instead of the zero position aimed at including the same amount of "up" and "down" movement in adjusting the rod in each series, as it is possible that upward movement may require more motivation than downward movement —an important consideration in dealing with schizophrenic patients.

Results

In order to confirm the hypothesis that size constancy in schizophrenics is impaired, and that their judgment of size is more determined by the size of the retinal image, than the judgment of the normals and non-schizophrenics, the results of the experiment should show:

(1) That the schizophrenics underestimate the sizes in comparison with the other groups.

(2) That they do so to a greater extent at the longer distance (15 m.), than at the shorter distance (7·5 m.).

The statistical techniques used were analysis of variance and covariance of the average error.

TABLE I

Diagnosis	Average Error		Standard Deviation		Variance	
	7·5 m.	15 m.	7·5 m.	15 m.	7·5 m.	15 m.
Schizophrenics ..	−0·69	−0·86	1·1096	1·6906	1·2312	2·8581
Normals	+0·07	+0·32	1·0453	1·3225	1·0926	1·7490
Non-schizophrenics	+0·02	−0·06	0·7900	1·0600	0·6241	1·2360

TABLE II

Analysis of Variance. Distance—7·5 m.

Source of Variation	Sum of Squares	df.	Mean Square	F.
Between groups	9·8646	2	4·9323	
Within groups	94·5441	63	1·5022	3·2833
Total	104·4087	65	—	—

$$\text{F ratio}=\frac{4\cdot9323}{1\cdot5022}=3\cdot2833 \qquad 0\cdot05>p>0\cdot01$$

TABLE III

Analysis of Variance. Distance—15 m.

Source of Variation	Sum of Squares	df.	Mean Square	F.
Between groups	21·2761	2	10·6380	3·6524
Within groups	183·4982	63	2·9126	—
Total	204·7743	65	—	—

$$F \text{ ratio} = \frac{10{\cdot}6380}{2{\cdot}9126} = 3{\cdot}6524 \qquad 0{\cdot}05 > p > 0{\cdot}01$$

TABLE IV

The "t" Test for the Differences Between Mean Average Error

Groups	Distance 7·5 m. Difference	"t"	Distance 15 m. Difference	"t"
Schizophrenics — Normals	0·76	2·7737 p<0·01	1·18	9·6721 p<0·01
Schizophrenics — Non-Schizophrenics	0·71	2·9027 p<0·01	0·80	2·2841* 0·05>p>0·01
Non-Schizophrenics — Normals	0·05	0·2123 non-significant	0·38	1·2500 non-significant

* The "t" test for this difference was modified in accordance with the procedure proposed by D. G. Cochran and G. M. Cox for dealing with cases where variance is not homogeneous. (D. G. Cochran and G. M. Cox, *Experimental Design*; John Wiley and Sons, New York, 1950, pp. 92–93.)

All the differences between the Schizophrenics on the one hand and the Normals and Non-Schizophrenics on the other are in the predicted direction and are statistically significant.

The next step is to find out to what extent the estimations of the sizes by the three groups are influenced by the change of distance from 7·5 m. to 15 m. There are positive correlations in the three groups between the estimation of sizes at the two distances:

TABLE V

Diagnosis	r.	p.
Schizophrenics	+0·42	0·05>p>0·01
Normals	+0·74	p<0·01
Non-schizophrenics	+0·64	p<0·01

The subjects who tend to overestimate at the shorter distance tend also to overestimate at the longer distance, and the subjects who tend to underestimate at the shorter distance tend also to underestimate at the longer distance. Therefore, analysis of covariance is required.

TABLE VI

Analysis of Covariance. Distances 7·5 m.–15 m.

Source of Variation	Sum of Squares of Errors of Estimate	df.	Mean Square	F.
Total	22·1064	64	—	—
Within groups	20·9273	62	0·3375	1·7467
Adjusted means	1·1791	2	0·5895	—

$$F = \frac{0{\cdot}5895}{0{\cdot}3375} = 1{\cdot}7467 \text{ (non-significant).}$$

The difference between the Schizophrenics and the Normals is in the expected direction. The schizophrenics tend to underestimate the sizes to a greater degree at 15 m., than at 7·5 m. (see Table I), and the Normals tend to overestimate the sizes to a greater degree at 15 m., than at 7·5 m.

To test the significance of this difference an average difference between the 7·5 m. distance scores and the 15 m. distance scores was calculated for the Schizophrenics and Normals. Mean difference between the scores in the Normals $=+0\cdot2466$, S.D. $=0\cdot8900$, S.E. $=0\cdot598$. Mean difference between the scores in the Schizophrenics $=-0\cdot3040$, S.D. $=1\cdot0893$, S.E. $=0\cdot1956$. Mean difference Normals-Mean difference Schizophrenics $=0\cdot5506$, S.E.(d) $=0\cdot2526$.

$$z=\frac{0\cdot5506}{0\cdot2526}=2\cdot1797 \quad (0\cdot05>p>0\cdot01)$$

However, in view of the negative result in analysis of the covariance, no great importance should be attached to this difference of the "average differences" between the 7·5 m. distance and 15 m. distance.

The finding, which to a certain extent could invalidate the results obtained, is the lack of sufficient homogeneity of variance (as tested by Bartlett's test) for the 15 m. distance. However, it is a well-known fact that schizophrenics show greater variability than other groups in physiological and psychological tests and the lack of homogeneity of variance in the samples may be expression of this greater variability of the schizophrenic population. Moreover, the lack of homogeneity affects only the variance of schizophrenics and non-schizophrenics for the 15 m. distance. The modified "t" test as proposed by Cox and Cochran was used in this case to test the difference between these means.

In the individual experiments, the schizophrenics displayed a greater variability than the other groups.

TABLE VII

Diagnosis	VA—The Average Variance of Each Score*	
	Distance 7·5 m.	Distance 15 m.
Schizophrenics	5·0656	3·8625
Normals	1·2039	1·7383
Non-schizophrenics	1·2043	1·6607

* It will be remembered that the score of each individual was derived from averaging 20 readings. The average variance is the mean variance of these 20 readings in each group.

F. Ratios

TABLE VIII

Groups	F—Distance 7·5 m.	F—Distance 15 m.
Schizophrenics–Normals	4·2076 $p<0\cdot01$	2·2219 $0\cdot05>p>0\cdot01$
Schizophrenics–Non-schizophrenics ..	4·2062 $p<0\cdot01$	2·3258 $0\cdot05>p>0\cdot01$
Non-schizophrenics–Normals ..	1·0003 non-significant	1·0467 non-significant

The performance of schizophrenics is significantly more variable than that of the normals and non-schizophrenics. There is no difference between the two latter groups.

It is of some interest to find out how size constancy in each group is related to the magnitude of the perceived size.

The average estimations of the perceived individual sizes were calculated for each group. (See Tables IX and X).

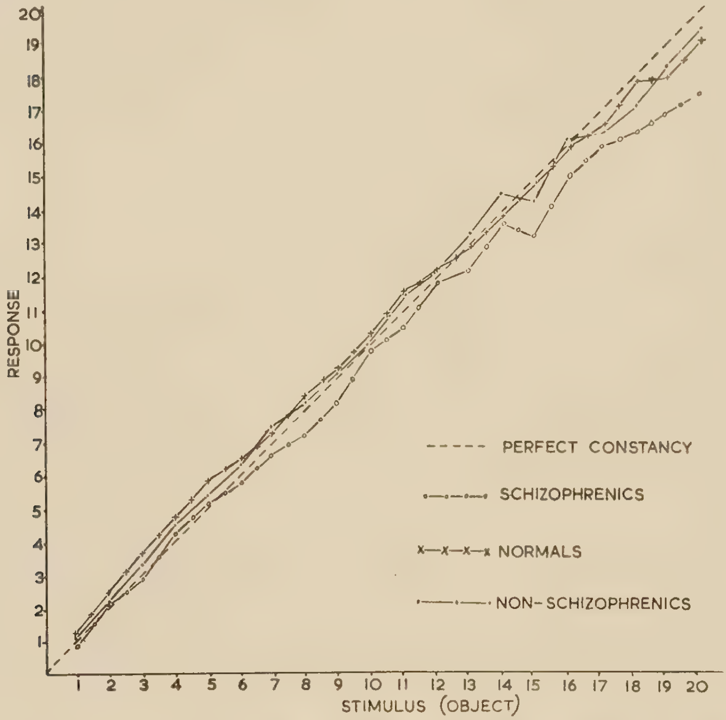

FIG. 1.—Schizophrenics, Normals and Non-Schizophrenics. Distance—7·5 metres. The three marked lines represent the average responses of the schizophrenics, normals and non-schizophrenics, plotted as a function of the size in centimetres of the standard rod. The straight, broken line represents the same function if the constancy were perfect.

In Figures 1 and 2, the straight lines at 45° are the lines which would represent the function of the estimates of the sizes, and the standard stimuli if constancy of perception were perfect. The estimations determined completely by the sizes of the retinal images would be represented by an almost horizontal line at the bottom of the graph. It can be seen that the plots of the estimates of the schizophrenics deviate in the direction of the plots of the retinal images. (The angle is less than 45°, and is smaller than the angles of the plots of the two other groups. This is more pronounced at the 15 m. distance.)*

Reliability

In order to establish the reliability of the experimental procedure and in order to find out whether size constancy is an enduring trait, the experiment

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* In this paper a simple randomized design for the analysis of variance has been used. From the Tables IX and X, it appears that the size of the standard rod may be a relevant variable contributing to the variance. This problem could be solved by a treatment by levels design, but for testing the hypothesis with which this experiment is concerned, the randomized design is sufficient.

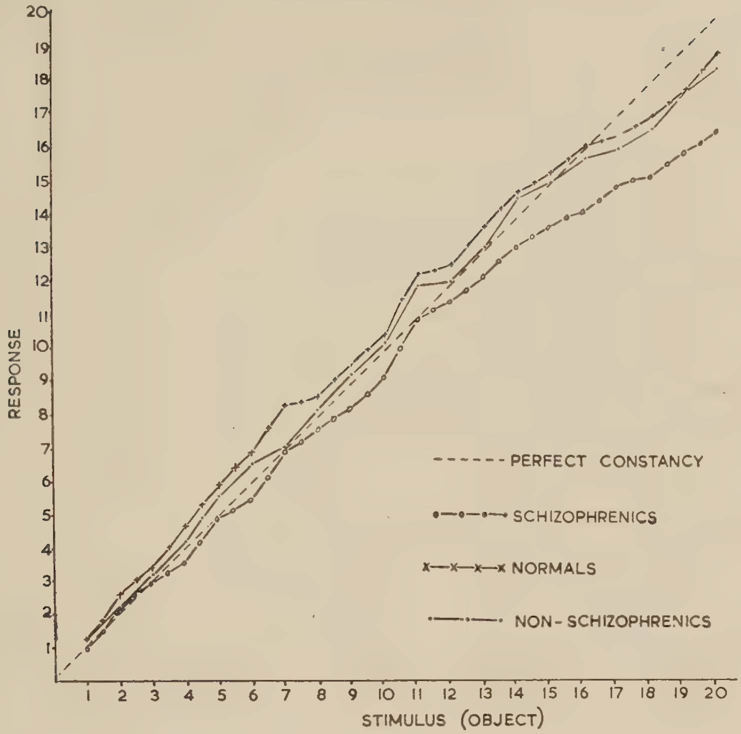

FIG. 2.—Schizophrenics, Normals and Non-Schizophrenics. Distance—15 metres. The three marked lines represent the average responses of the schizophrenics, normals and non-schizophrenics, plotted as a function of the size in centimetres of the standard rod. The straight, broken line represents the same function if the constancy were perfect.

was repeated on 20 schizophrenic patients. Those few who tended to overestimate in the first experiment were included, some who tended to underestimate, and a few border line cases. The Spearman rank—difference correlation (rho) between the score of each subject in the first experiment and the second experiment was calculated. (Time interval between two experiments was about one month.)

For the distance 7·5 m. rho $= +0 \cdot 64$ ($p < 0 \cdot 01$)

For the distance 15 m. rho $= +0 \cdot 89$ ($p < 0 \cdot 01$)

This finding agrees with the result of a preliminary experiment in which size constancy was measured by the same method on a 10 subject group of normals on two occasions. Distance 15 m. was used. The obtained rho was $0 \cdot 70$ ($0 \cdot 05 > p > 0 \cdot 01$).

It appears that the type of size constancy reaction is not an accidental finding, but is an enduring trait of an individual, and that its measurement is reliable.

DISCUSSION

This study supports the hypothesis that chronic schizophrenics, mainly of the hebephrenic type with personality deterioration and thought disorder, have as compared with normal controls and non-schizophrenic patients diminished size constancy of perception.

No claim is made that it applies to all schizophrenics. Also, the effect of prolonged hospitalization has not been excluded, as the schizophrenic and

TABLE IX
Distance 7·5 m.

Diagnosis	1 cm.	2 cm.	3 cm.	4 cm.	5 cm.	6 cm.	7 cm.	8 cm.	9 cm.	10 cm.	11 cm.	12 cm.	13 cm.	14 cm.	15 cm.	16 cm.	17 cm.	18 cm.	19 cm.	20 cm.
Schizophrenics ..	0·9	2·1	2·9	4·2	5·1	5·6	6·6	7·2	8·2	9·8	10·5	11·9	12·2	13·6	13·2	15·0	15·9	16·3	16·8	17·4
Normals	1·3	2·4	3·6	4·7	5·8	6·5	7·3	8·4	9·2	10·3	11·6	12·1	12·9	13·8	14·8	15·9	16·5	17·8	17·9	18·9
Non-schizophrenics ..	1·2	2·3	3·3	4·5	5·4	6·4	7·5	8·3	9·2	10·0	11·5	12·1	13·3	14·5	14·2	16·1	16·3	17·1	18·3	19·4
Size of the Retinal Image*	0·0013	0·0026	0·0040	0·0053	0·0066	0·0080	0·0093	0·0106	0·0120	0·0133	0·0146	0·0160	0·0173	0·0186	0·0200	0·0213	0·0226	0·0240	0·0253	0·0266

* Size of the Retinal Image: $a = \frac{A}{D}$, where A—size of the object, D—distance of the object.

TABLE X
Distance 15 m.

Diagnosis	1 cm.	2 cm.	3 cm.	4 cm.	5 cm.	6 cm.	7 cm.	8 cm.	9 cm.	10 cm.	11 cm.	12 cm.	13 cm.	14 cm.	15 cm.	16 cm.	17 cm.	18 cm.	19 cm.	20 cm.
Schizophrenics ..	0·9	2·1	3·0	3·6	4·9	5·5	7·0	7·6	8·3	9·2	11·1	11·5	12·2	13·2	13·8	14·3	15·0	15·3	16·0	16·6
Normals	1·2	2·6	3·4	4·6	5·9	6·9	8·3	8·6	9·5	10·4	12·3	12·5	13·7	14·7	15·3	16·1	16·5	17·0	17·8	18·9
Non-schizophrenics ..	1·2	2·2	3·2	4·2	5·6	6·6	7·1	8·2	9·3	10·2	12·0	12·1	13·0	14·6	15·0	15·8	16·0	16·7	17·9	18·5
Size of the Retinal Image	0·0007	0·0013	0·0020	0·0026	0·0033	0·0040	0·0046	0·0053	0·0060	0·0066	0·0073	0·0080	0·0086	0·0093	0·0100	0·0106	0·0113	0·0120	0·0126	0·0133

non-schizophrenic groups differ in the length of hospitalization. However, when the organic cases, seniles, and the epileptic cases, which may be organic, are excluded, one is left with the chronic population of mental hospitals, which is almost entirely schizophrenic. Therefore, it is extremely difficult to procure a comparable sample of chronic patients, who are not schizophrenic, and it is extremely difficult to extricate the factor of prolonged hospitalization from the factor of schizophrenia.

In order to study the potential influence of lack of control for differences in intelligence, 10 normal subjects were administered Raven's Progressive Matrices. The relation of these scores with the constancy score indicates no definite evidence of relationship, which is in agreement with Raush's (11) finding.

Schizophrenic patients show a greater variability of performance in individual experiments than the two other groups. This agrees with the general tendency of schizophrenics to show great variability of performance on psychological tests.

H. L. Raush (11) has found that early paranoid schizophrenics displayed a higher size constancy than normals. In the study reported in this paper, it has been found that chronic schizophrenic patients, who mainly belonged to the hebephrenic type, displayed lower size constancy. A possible explanation of this difference is that the breakdown of size constancy and therefore of constancy of perception is related to thought disorder of the schizophrenic patients. Most of the schizophrenic patients who were used in the experiment appeared to have a marked thought disorder when examined clinically. The relation between thought disorder and size constancy is being investigated at the present moment. Methods are being developed for assessing thought disorder more objectively than the clinical impression.

When one enquires into the implications for the schizophrenic process of the breakdown in constancy of perception and its greater variability, one is tempted to make certain generalizations. Hoskins and his group (10) found that in schizophrenia there is an impairment in function of many physiological homeostatic mechanisms. There is a defect in adaptation of the internal environment of the organism to changing conditions.

Constancy of perception and conceptual, symbolic thinking may be viewed also as homeostatic mechanisms, which aim at maintaining the external, behavioural environment of the organism within certain limits stable. The importance of it for the adaptation of the organism is quite obvious. It allows us to live in a world of definite and probable things, which can be classified in a predictable way, and which display certain regularities of appearance and behaviour. These regularities in their turn are abstracted, codified and expressed in the form of symbols. It is possible that in schizophrenia there is a breakdown of these higher homeostatic mechanisms, a breakdown of co-ordination of various functions, although the individual functions are not affected.

Raush's findings indicate a possibility of existence in early schizophrenics and in some chronic schizophrenics of a compensatory, although more primitive mechanism, by means of which the individual endeavours to stabilize the breaking down, behavioural environment. Constancy of perception in these patients is higher than in normals and also a watertight system of delusions is created. On the other hand, however, these phenomena may be due to a disorder of homeostasis in the opposite direction: the behavioural environment becomes too constant, too unchanging to be compatible with the physical, external environment. This, of course, leads to a breakdown of adjustment. Be this as it may, one conclusion appears to be certain—schizophrenia leads to subtle perceptual disorders, which in their turn influence the course of the disease.

SUMMARY

1. It was found that size constancy of perception in chronic schizophrenics belonging mainly to the hebephrenic type, who have been many years in the hospitals, was lower than that in normal controls and non-schizophrenic patients.

2. There is a possibility that this may be related to disorder of thought.

3. The schizophrenics showed a greater variability in the performance in the individual experiments, than both the normals and non-schizophrenics.

4. The implications of these phenomena for the schizophrenic process are discussed.

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THE USE OF CHILDREN'S DRAWINGS IN CLINICAL DIAGNOSIS

By

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INTRODUCTION

In a recent article on Freud in the *Manchester Guardian*, Professor John Cohen remarks: "Freud was alive to the idea of a statistical conception of mind. He even considered the possibility of subjecting his theories to statistical tests. He refused to do so because he did not want to 'count together apples, pears and nuts'." (1)

It has seemed to me for some time that one should begin to try and get clinically some objective method of assessment of the psychological problems of children, other than the lengthy, complicated and usually artificial psychological tests, and that this clinical assessment should rightly be by a really spontaneous production of the child himself. This is not to say that the intuitive understanding of the psychiatrist is to be underestimated or disregarded, but that for the purpose of furthering knowledge and of comparison between workers, another approach is needed as well. If I may make a comparison with a physical condition, the diagnosis of anaemia may be made by a physician on sight, or on sight plus the patient's recital of his history and symptoms, but this clinical wisdom does not obviate the necessity of an objective examination of the blood and possibly of other organs.

The question which then arose was what, in a psychiatric interview with a child, can one possibly use as such an objective method of assessment. Few children are good verbalizers and quite often one either gets from them monosyllabic answers of yes and no, or the even more evasive "I don't know", so that an attempt to get a clinical impression even by this means would undoubtedly fail. There remain the non-verbal methods of communication, play, modelling and drawing. I have long regarded this last as generally the most useful method of approach in a diagnostic interview, partly because nearly all children are willing to draw, and many enjoy this as a pastime at home as well as a class at school, whereas plasticine quite often figures as forbidden, especially in the child's tidy clothes, and he commonly appears in these, at least on his first visit. Further, although many children eye the toys of a children's clinic with envy, they are often too shy, or too curious to handle each one, to settle down to any constructive play the first time they come. Moreover, drawings can be followed and reported step by step, so that the whole is analysed, whereas this process cannot be done nearly so easily or accurately with either of the other forms of non-verbal communication.

Thus my choice for objective study fell upon drawing, and this present very tentative survey embodies the report on the drawings in diagnostic interviews of a consecutive series of 108 children seen in the two clinics where I work, with the addition of 50 boys from a school for maladjusted boys and, as controls, a series of 30 children from Children's Homes and 100 children from ordinary schools, primary, junior, secondary modern and grammar school. In the work which follows it has mainly been found necessary to consider the children from the Homes separately, first because the small numbers, when analysed into age groups, make them too disparate; and partly because it seems impossible to assume that they belong either to the group of normals or, of necessity, to the abnormal. At this point I should like to stress that I feel that very few of the figures offered should be regarded, in any case, as results; since by the time the children are analysed into age groups, the numbers in some cases are very small, or are so disparate that statistical evaluation becomes impossible. Where this is true, the raw figures have been included, as possibly suggesting where lines of further enquiry might be profitable, and these have, for the most part, been expressed as percentages.

It has been widely held, and not only by the dynamic schools of psychology, particularly the Jungian group, that graphic art is probably one of the commonest ways in which the "unconscious" can be expressed, that such a method can reach depths which are inaccessible to verbalizations, or promote understanding where, for any one of a variety of reasons, the patient cannot or will not express what is in his mind in words. True art is the spontaneous expression of the subjective experience of the artist, not just the photographic report of an external reality, but an individual and personal perception of an external reality. In this expression of reality, too, we find that the influence of the culture also has its effect, and we may pass from the formal portraiture of the 18th Century to that of Picasso, but within each of these schools the identity of the individual painter leaves its mark. Thus, Lauretta Bender remarks, "He (the artist), communicates his vision, so that the other individual may know what is going on in him" (2). In some ways this is perhaps most strikingly shown where there is one non-variable factor, such as, for instance, the many paintings of Madonna and Child throughout the centuries and in differing cultures. Another facet is shown here too: the Madonnas are never of Semitic type though clearly that must have been the external reality, an expression, one feels, of the great antagonism to such a thought.

When one comes to relate these facts to the art of children, we find, I think, that they are perhaps even more true. The child expresses what is true for him. Herbert Read says: "The child's graphic activity is a specialized medium of communication, with its own characteristics and laws. It is not determined by canons of objective realism, but by pressure of inner subjective feeling or sensation" (3). Werner Wolff goes into more detail: "Thus we may conclude that the 'wrong' proportions are for the child affective proportions—a drawing or a painting is an expression of mental concepts rather than a photograph of nature" (4), and Lauretta Bender feels that: "when distortions of the body image occur they are bound to have a close relation to the specific human problem of the child" (5). I would like to add that I feel this conception is true of distortions of any image.

In the small child where phantasy and reality are still not clearly differentiated, this kind of expression is seen in its purest form; the inside and outside of a house are seen at once; the relative sizes of people are determined by their relative importance, an extension of the Red Riding Hood-Wolf idea:—"How big your eyes are, Grandma"—"All the better to see you with, my dear!", culminating in "How big your teeth are, Grandma"—"the better to eat you with!", and personification of inanimate structures occurs (see Fig. 2).

As children grow older and separate more clearly this phantasy or internal reality from actuality, there is a greater tendency to portray familiar objects more objectively and express internal ideas by more direct symbolism or to flee from them into the abstract. "I will draw you what I drew in school this morning" is one way of doing this; another line of escape being the formalized pattern, and Lauretta Bender suggests that "in many of our drawings the children are interested in landscapes when they want to escape difficult personal situations" (6). When children have reached this stage, have entered and passed through some part of school life, the value of omissions and of the inclusion of special features seems to become therefore the important factor, and this point is noted by Alschuler and Hattwick: "We note that as children grow older, their paintings become less and less self-expressive. Children tend gradually to portray the realistic details of seen objects or to adopt popular schematic or usual pictorial methods of depicting them" (7). In sum, this would seem to indicate that children's most spontaneous productions are, in fact, symbolic of their internal reality, an expression of their unconscious thoughts and feelings negative and positive. Freud held the view that generalized symbolism is an "id" expression, detailed individual structure an "ego" expression.

METHOD OF ENQUIRY

Working with these basic thoughts in mind, this is an attempt to assess both their validity and the use that can be made of them if valid; by an enquiry first into what children draw at different ages, a macroscopic view; and next how they construct a comparable kind of drawing, in this case a house, what is put in and what is left out; and finally what is the relation between this and the background of their personality, and their symptoms, where these are present.

All the children were provided with a piece of white drawing paper, 10 inches by 8 inches, a pencil and a box of coloured pencils, but no eraser, and all were allowed up to 20 minutes for the drawing, though it was found by experience that very few availed themselves of so much time. The children who attended the Clinic were, of course, seen in the clinical setting; those in the ordinary schools and the Children's Homes were seen in the schools and Homes respectively, and those from the school for maladjusted children either in the school or at the interview prior to admission. In each case the approach to the child has been the same. "I would like you to draw me something, it can be anything you wish. Here is paper and a pencil and coloured pencils." In view of the fact that from earlier clinical experience I had formed the opinion that in these circumstances the commonest drawing produced is a house, and that therefore the detailed investigations should be of the houses produced, this was followed up, when the child had completed his first drawing, if it was not a house, by a further request, "Now will you draw me a house on the other side, it can be any sort of house you like, and in the town or the country". As all the children except those in the residential school, and in their own homes a considerable proportion of these too, are City dwellers, it is important here to notice that almost all the productions are houses in the country.

It must, of course, be true that to a certain extent the whole experiment was carried out under artificial conditions, but it seemed impossible, by any means, to eliminate this factor, since any situation where a child is picked out from his fellows, goes alone to a strange adult, and is invited to draw for him, must arouse questions in the child's mind and delete something from his spontaneity of production. Nevertheless it was felt, since all the children in comparable situations were dealt with in the same way, that this factor was reduced to a minimum, and that a remark by two boys in the school for maladjusted boys (overheard by one of the staff and subsequently reported to me), to the effect that of course "I drew what she wanted" needs to have interpolated, "what I thought she wanted" and that the operative factor is in the omitted "I thought", the only deduction of what "she wanted" having been the second request to draw a house. It will be seen that these boys did not, in fact, draw a bigger proportion of houses than might have been expected, nor was there any obvious relation, when the matter was gone into subsequently, between the order in which the boys came and the proportion of those who drew houses first, nor between those who drew the one type of house peculiar to themselves, the school in which they were residents.

RESULTS

The first results that came from the enquiry concerned the proportion of children in comparable age groups (and these are arranged according to school transfer), who spontaneously drew houses, and this is set out in Table I. These have been calculated in three statistical tables, (1) children of all ages ranged in three groups, normal, disturbed, and those from the Children's Homes, (2) the same grouping, omitting the Children's Homes and (3) the normal and disturbed in the age range 11–15. It has been impossible to express the younger age groups separately statistically because of the disparity of numbers.

Observed Table

Group	House First	House Not First	Total	Per cent.	
Disturbed	45	110	155	29·032	70·967
Normal	18	82	100	18·000	82·000
Children's Homes ..	12	18	30	40·000	60·000
Total	75	210	285	26·316	73·684

TABLE I

House First

	Total No.	5–8	8–11	11–15+	Total	Per cent.
Primary School	20	8	—	—	8	40
Junior School	20	—	3	—	3	15
Secondary Modern Mixed ..	20	—	—	4	4	20
Boys' Grammar School ..	20	—	—	2	2	10
Girls' Grammar School ..	20	—	—	1	1	5
Children's Homes—30:						
Group 1	10	6	—	—	6	60
Group 2	9	—	5	—	5	55
Group 3	11	—	—	1	1	10
Child Guidance Clinic—108:						
Group 1	20	8	—	—	8	40
Group 2	38	—	16	—	16	42
Group 3	50	—	—	11	11	22
School for Boys—50:						
Group 1	—	—	—	—	—	—
Group 2	15	—	5	—	5	33
Group 3	35	—	—	5	5	14
Total		22	29	24		
Per cent.		44	35	17		

This table suggests that there is difference in the different groups, since it is clear that the normal group draw fewer houses than either the disturbed group or the children from Children's Homes; the statistical investigation supports this for $\chi^2{=}7{\cdot}05$ and $P{=}{\cdot}05$ as shown below.

Expected Frequencies

Group	House First	House Not First	Total
Disturbed	40·789	114·211	155
Normal	26·316	73·684	100
Children's Homes	7·895	22·105	30
Total	75·000	210·000	285

χ^2	Group	House First	House Not First	
	Disturbed	0·434	0·155	
	Normal	2·626	0·938	7·05 χ^2
	Children's Homes ..	2·140	0·764	$\cdot02<P<\cdot05$

Following this up with an investigation where Children's Homes are excluded we get, as one would expect, a less significant result, but still one that is statistically significant. The observed table is shown below; and in this case, calculation shows χ^2 to be 3·976 and $P<\cdot05$.

Observed Table

Group	House First	House Not First	Total	Per cent.	
Disturbed	45	110	155	29·032	70·967
Normal	18	82	100	18·000	82·000
Total	63	192	255	24·706	75·294

As, from the original figures in Table I, it seemed likely that there was also an important difference in the oldest age group: viz. 11–15, a further investigation was made into this: but here the statistical evaluation does not confirm the expectation $\chi^2{=}1{\cdot}349$, $\cdot3<P<\cdot5$.

Observed Table—Age Range 11–15

Group	House First	House Not First	Total	Per cent.	
Disturbed	16	69	85	18·823	81·177
Normal	7	53	60	11·667	88·333
Total	23	122	145	15·862	84·138

Thus we may conclude from these figures that the hypothesis that the commonest spontaneous drawing is the house is true only throughout the series of the youngest age group (5–8); and that in the overall picture of all the age groups there is a significant difference between the normal and disturbed groups. It would also seem to be likely, in view of the very high figure coming from the Children's Homes, that this has to do with emotional deprivation and immaturity, an hypothesis which should be further tested.

TABLE II

House First

	Ships	Figures		Landscapes	Miscellaneous		Total	Per cent.
		Reality	Phantasy		Reality	Phantasy		
Primary School	5	5	—	—	1	—	11	55
Junior School	2	5	4	1	4	—	16	80
Secondary Modern Mixed	4	2	—	3	6	—	15	75
Boys' Grammar School	9	1	1	2	6	—	19	90
Girls' Grammar School	1	4	2	6	6	—	19	90
Children's Homes:								
Group 1	—	1	—	—	2	1	4	40
Group 2	2	—	2	—	1	—	5	55
Group 3	3	—	—	1	5	—	9	82
Child Guidance Clinic:								
Group 1	4	2	1	—	4	—	11	55
Group 2	7	4	4	2	5	2	24	63
Group 3	5	7	2	4	20	1	39	78
School for Boys:								
Group 2	—	1	2	—	4	—	7	50
Group 3	5	6	2	4	13	—	30	86
	47	38	20	23	77	4	—	—

Some of the difficulty in balancing figures is due to inevitable inaccuracies because of small numbers involved, so that decimal points have been ignored.

There is also a small number of cases among the clinical cases where the child refused to draw at all.

The next point of interest (Table II) has not been investigated in detail, and is the drawings that were produced first. Of these, the commonest was the ship, and was exclusively produced by boys. One might consider this as possibly culturally determined, or, alternatively, as another variety of female symbol, as Freud holds. It is interesting to note, in this connection, that the highest proportion of ships came from Grammar school boys, 45 per cent. of whom drew ships first, a group in which either of these theoretical causes might operate, since the traditional interest in the sea in England is strong, but it is also true that in early adolescence a revival of interest in the mother might be expected, and that this might well be expressed, in the more intelligent and mature boy, by the less direct symbol of the ship, rather than that of the house, to which they may have consciously ambivalent feelings, as being restricting as well as protecting.

One drawing of special interest has been included and is relevant in this connection as showing that such a cultural determinant may work positively or negatively, and may be inextricably interwoven with the child's internal dynamics. This is the drawing, in response to a request for a house, by a young Quaker boy, brought up by strictly Quaker parents, and having attended schools planned and run on the principles of the "Friends"; of a French Foreign Legion Fort (Fig. 3). One feels, on the one hand, that this is the epitome of an outlet for indeterminate aggressive feeling, to which no direct channel is available, and on the other, something which would be quite "shocking" to the whole of his world.

The next group was figures, subdivided into representations of real people —a man, a girl, etc.—and creatures of phantasy varying from those as nearing reality as the cowboy to Father Christmas and an angel; then came landscapes, of which Bender's remark has already been noted.

Finally there is a miscellaneous collection again divided between those related to phantasy and those to reality. It was extremely difficult to draw the line here, but such drawings as bonfires, produced on or around 5 November, Christmas trees, etc., in the period around Christmas, were accepted as part of the child's reality, whereas spaceships, fairies, representatives of Disney figures, were considered as creatures of phantasy. It was further noted as of interest that there were very few aeroplanes in the whole group, and that, speaking from a memory impression, I feel that there would have been far more had this investigation been undertaken in or just after the war. No statistical investigation of these drawings was attempted, because of the small numbers involved.

An analysis of the way in which the houses were drawn followed next, and this part of the work included both the houses which were drawn spontaneously and those which were subsequently asked for specifically; so that the whole group of children contributed to this part of the investigation, with the exception of the few who refused to draw at all—of these there were three, all from the group of clinical cases, one from the 8–11 age group and two from the 11–15. The simplest type of house is described as the "square box" type, sometimes drawn with the floor and sometimes without, sometimes with a roof added either immediately or after inserting other features first. This type of elementary house is seen mainly in the young normal children, and in a decreasing proportion in the older age groups, being commoner in the disturbed children than in the ordinary schools (Table III).

Table III

Square Box Type of House

		With Floor and Roof	With Floor	Without Floor	Total	Per cent.
Primary School ..	20	5	1	9	15	80
Junior School ..	20	—	—	—	—	—
Secondary School ..	20	—	—	—	—	—
Boys' Grammar School	20	1	—	—	1	5
Girls' Grammar School	20	1	—	—	1	5
Children's Home:						
Group 1 ..	10	—	3	4	7	70
Group 2 ..	9	2	—	1	3	33
Group 3 ..	11	2	—	—	2	18
Child Guidance Clinic:						
Group 1 ..	20	—	—	—	—	—
Group 2 ..	38	1	1	—	2	5
Group 3 ..	50	2	3	—	5	10
School for Boys:						
Group 2 ..	15	—	—	—	—	—
Group 3 ..	35	—	1	—	1	3
Total ..	288	14	9	14	37	13

We come next to the way in which the children "built" their houses. These are tabulated in Table IV.

TABLE IV

General Order of Structure

Part of House	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Roof	147	64	16	3	1	1	1	1	1	—	1	—	—	—	—	—
Walls	71	123	29	6	4	3	—	—	—	—	—	—	—	—	—	—
Floor	—	14	110	26	10	5	5	3	1	—	2	—	—	—	—	—
Chimney ..	2	28	38	28	15	20	22	32	20	15	3	5	2	1	—	—
Smoke	—		13	19	15	8	12	11	20	10	9	4	2	2	1	—
Door	1	4	10	44	55	60	35	23	7	8	2	-	1	1	—	—
Handle	—	1	1	8	21	25	39	24	19	6	5	2	1	1	1	—
Windows, Upper	—	6	32	56	50	31	23	20	10	7	1	2	—	—	—	—
Windows, Lower	1		4	31	48	46	39	21	24	9	3	1	1	—	—	—
Drain pipe ..	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Outside structures	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

The outstanding features of structure here have been investigated statistically, and the following table shows that there is statistical evidence of a "normal" way of "building" a house graphically, at least in its broad outlines. A word of explanation about the alteration in total figures is necessary here. Excluded from these statistical calculations are the 3 children who refused to draw at all, 30 from the Children's Homes, which have been excluded from this part of the enquiry, 25 who drew the square box type of house and 12 where the order of drawing was impossible to ascertain, leaving a total of 215 of the 285 drawings received. Of these drawings, 135 children put in the roof first and 80 put it in later.

Group	Roof First	Roof Not First	Total	Per cent.	
Disturbed	77	58	135	57·037	42·963
Normal	58	22	80	72·500	27·500
Total	135	80	215	—	—

$\chi^2 = 5{\cdot}14$ $\quad {\cdot}05 > P < {\cdot}05.$

As a natural phenomenon, the walls were almost invariably "built" in association with the roof and with the floor, where the last was included and, in fact, examination proves this to be true both of the normal and disturbed. The occasional variation of this principle being where the chimney immediately followed the construction of the roof. In passing it may be noted that this was also true of other structures that have a necessary relationship with each other; chimney and smoke, door and handle, window pane and window structure and/or curtains. Where the second of these pairs was included it was in something over 90 per cent. of cases put in in direct relationship with the first. In the few cases where this was not so, there was a very considerable space between, as if the subsequent putting in came as a conscious appraisal of what should be there, rather than as an integral part of a spontaneous expression. The omission was, as it were, "a slip of the pencil", betraying a strong negative feeling. Apart from the roof and walls, it is clear that the other features drawn first, 2 chimneys, both of which came from boys, 1 door, from the top age group of the clinical cases, 1 window (Fig. 6), also from this age group, and one feels directly related to the presenting symptom, 1 drainpipe, from a boy in the secondary modern school, and 13 children who started with some structure outside the house, as if negative to the suggestion they should draw a house; of those, 11 cases from the disturbed children, the remaining 2 coming from the secondary modern school.

A similar result is obtained in looking at those cases where it was impossible to ascertain the way in which the house was constructed. Again of the total of 12, 2 come from primary school children where it was noted that it was impossible because the children drew with such speed, 2 from grammar schools, 1 from Children's homes, and 7 from among the clinical cases where, with 2 exceptions, the note was that the child concealed the drawing.

When, however, we come to examine the omissions, and consider first the floor of the house, there is a significant difference statistically between the normal and disturbed as is indicated by the table below:

Group	Floor Present	Floor Absent	Total	Per cent.	
Disturbed	97	38	135	71·851	28·149
Normal	67	13	80	83·750	16·250
Total	164	51	215	—	—

$\chi^2=3\cdot94$. $\cdot02>P<\cdot05$.

TABLE V

Omissions

		Floor	Chimney	Door	Handle to Door	All Windows	Upper Windows	Lower Windows	Structure to Windows
Primary School	20	3	1	–	4	1	–	–	15
Junior School	20	6	2	–	2	–	–	1	2
Secondary Modern School	20	3	5	–	7	1	–	–	3
Boys' Grammar School	20	–	6	–	8	–	–	–	–
Girls' Grammar School	20	1	2	3	4	–	2	1	2
Children's Homes:									
Group 1	10	5	2	1	4	1	–	2	3
Group 2	9	4	1	1	2	2	–	–	4
Group 3	11	2	2	1	6	4	–	–	1
Child Guidance Clinic:									
Group 1	20	9	1	2	8	–	1	3	9
Group 2	38	10	3	3	11	–	2	3	10
Group 3	50	11	9	1	19	–	4	2	12
School for Boys:									
Group 2	15	2	2	–	2	–	1	2	2
Group 3	35	6	11	2	11	–	3	3	14
Total	288	62	47	14	88	9	13	17	77
Per cent		26	17	5	31	3	5	6	27

3 No drawings.
37 Square Box.
12 Order impossible to ascertain.

A very interesting feature appeared when the figures for the omission of chimneys from the house are examined. Here it seemed as if such omissions were sex-determined, as the percentage figures for the normal boys from the grammar school and the boys of corresponding age in the school for maladjusted boys were both around 33.

An analysis of the figures with this in mind proved them statistically valid.

Group	Chimney Omitted	Chimney Present	Total	Per cent.	
Girls	7	80	87	8·965	91·035
Boys	33	165	198	11·617	88·383
Total	40	245	285	—	—

$\chi^2=3\cdot71$. $\cdot05>P<\cdot10$.

Since this was a sex analysis. all the houses were included, however they were constructed and from whatever group they came. The omission of the door was next considered but here, although the only omissions in the normal group were in the girls' grammar school, on investigation, it was clear that among the disturbed children there were also a group of boys who omitted doors (see Fig. 10, from the school for maladjusted boys, Fig. 11, also a boy, and Fig. 13, both from among clinical cases). However, the omission of this feature, odd though it may seem to exclude something so necessary, cannot be proved statistically to be higher in the disturbed than in the normal group ($\cdot5>P<\cdot3$). The omission of the handle on the door is again statistically not conclusive between the disturbed and normal groups.

Omission of windows, however, produces a different picture, and here the striking feature is that to omit all the windows is mainly a phenomenon of the children from the Children's Homes, a matter which will be considered separately, and only 2 other children did this; but if we consider the cases where either the upper or the lower windows were omitted, in both cases only 2 of the "normal" children omitted these, but 11 of the disturbed children omitted the upper, and 13 omitted the lower. In calculating these omissions, the youngest age group has been excluded, as also in the following table, where an estimation is made of those who put no structure in their windows, but simply a black rectangle. The term structure here included some designs which suggest window panes and/or curtains.

Group	Structure Present	Structure Absent	Total	Per cent.		
Disturbed	97	38	135	71·859	28·141	Omitting age group 5–8
Normal ..	73	7	80	91·250	8·750	
Total	170	45	215	—	—	

$\chi^2=11\cdot42$ (for this table). $P<\cdot001$.

Even where the total group is included, the figure is suggestive, χ^2 then being $2\cdot133$ and $12>P<\cdot1$, but it is clear that the high figure in the normal children of the group 5–8 where 15 out of 20 put no structure into their windows is the important feature; and that to omit this after this age, the evidence of disturbance in further development.

At this point, it would perhaps be relevant to consider the children who were in homes, and who have largely been omitted from consideration in the former figures. This has been done because while, as remarked earlier, it seemed unsatisfactory to assume that all these children were disturbed, and yet some of the evidence suggested that it would also be misleading to consider them as normal.

The first observed table shows a higher figure in the drawing of houses first in this group than in either the "normal" or "disturbed" groups; and we have already noted that to draw a house seems to indicate failure of development where the child is more than 8 years. It is also true, when we look at the table showing the number of children who drew the square box type of house, the most primitive of the drawings, that this accounts for the houses of 12 out of the 30 children in the group, and nowhere else is there any figure near this, except in the primary school. Again, when we look at the omission of the floor, the omissions are far higher in proportion than in the disturbed group, which have already been found significant. In the latter, less than 20 per cent. omitted the floor, but in this group more than 33 per cent. did so. To put in windows and omit the structure is commoner with the disturbed group than with the one under discussion, but as has been noted, to omit windows altogether is something which is only done by 2 children, both in the normal group, apart from this one, where 7 put in no windows at all. This is a very striking feature, suggesting that perhaps these children regard their outlook as hopeless, or alternatively want no one to see the blankness inside.

The other very remarkable feature was the total poverty of the structure of their houses. The assessment of this has been crude and general, and the things taken into consideration were the objects outside the house, the outside world with which the children have relationship. These were assessed under three headings, None, 1 or 2, several, and the following table shows the working out of this for all three groups:

Group	None	1 or 2	Several	Total	Per cent.		
Disturbed ..	43	64	48	155	27·743	42·226	29·031
Normal	21	44	35	100	21·000	44·000	33·000
Children's Homes	15	14	1	30	50·000	46·667	3·334
Total ..	79	122	84	285	—	—	—

χ^2 for this total table=15·34. ·001 P<·01.

However, the most striking feature here is that only one child in the 30 from the Children's Homes produced more than 1 or 2 objects outside, that is between 3 per cent. and 4 per cent., whereas slightly less than 33 per cent. of the disturbed group did so, slightly more in the normal group. There is nothing new in saying that such children, deprived in early life of emotional contacts, become emotionally stunted, but this is perhaps one further interesting evidence of that. One last small point may be noted here, and that is among the additions to the house was that of extras to the door, commonly either a letter-box or a knocker. This is absent altogether from the boys in the residential school, and only 4 of the children in the Homes produced any additions to their doors, whereas of the rest of the children, both normal and disturbed, about 25 per cent. in each case produced such additions. This may perhaps be related to the fact that in neither of the first two groups have the children the opportunity to run to the door to answer a knock, or to collect letters, or possibly to the fact that their contacts with the outside world, represented in this way, are few or absent.

The detailed structure of roof and sometimes, though less commonly, of the brickwork of the house, is commonest among the adolescent girls, though this is less obvious in the girls in the secondary modern school than in the girls' grammar school. In the former, 33 per cent. of the girls produce such detail, in the latter 55 per cent.; one out of three girls in the top age group of the

TABLE VI

	Additional Features to House						Additional Features Outside								
	To Door	Lateral Window	View Inside	Detail of Roof or Brick	Side Door	Drainpipe	None	Trees	Fence	Gate	Path	Flowers	Figures	No. of House	Television
Primary School	2	2	1	—	—	—	3	6	2	—	2	9	9	—	—
Junior School	6	3	—	4	2	—	5	2	7	5	—	5	1	1	—
Secondary Modern School ..	8	7	—	6	—	1	5	8	8	2	10	—	—	—	1
Boys' Grammar School	5	7	—	7	6	1	1	10	10	4	4	—	—	—	1
Girls' Grammar School	5	5	—	11	5	—	2	12	13	6	10	2	—	—	—
Children's Homes:															
Group 1	—	1	—	—	—	—	3	3	—	—	—	—	3	—	—
Group 2	2	—	—	—	2	—	1	—	—	—	—	1	3	—	—
Group 3	2	3	—	3	2	2	5	1	1	—	—	—	—	—	—
Child Guidance Clinic:															
Group 1	2	3	1	3	1	1	4	4	2	2	5	2	5	—	—
Group 2	8	11	1	2	2	2	7	7	10	5	8	7	4	—	1
Group 3	14	11	—	9	6	5	10	15	18	11	16	7	4	2	2
Boys' School:															
Group 2	—	2	—	—	1	1	3	5	4	3	1	1	1	—	—
Group 3	—	4	—	4	1	5	12	14	7	3	13	4	—	1	—
Total 288	54	59	3	49	28	18	61	87	82	41	69	38	30	3	6
Percentage	79	20	1	17	10	6	21	30	28	14	24	13	10	1	2

Children's Homes, and 7 out of 13, or 54 per cent., among the clinical cases. Again one wonders whether this is related to adolescent development, and the generally accepted idea that the feminine mind is more concerned with detail than the masculine. The other three groups of additions to the house that have been recorded are: a simultaneous view of the interior, confined to 3 cases, the side door, fairly evenly distributed, with a bias towards the older child, and the drainpipe, where, out of a total of 18 cases, only 2 were girls.

In sum, it seems clear from the figures produced, that there are features about these spontaneous drawings which enable us in some degree to separate the normal from the disturbed, the "Nuts" from the Apples and Pears!

When, however, one turned to the task of trying to relate the abnormalities in the drawings to the symptoms from which the child suffered, the analysis becomes totally unsatisfactory, and clearly a fresh enquiry will need to be made before one can hope to develop any theory on this side. In nearly every case it was true that both the symptoms and the abnormalities were multiple, and that therefore no conclusions could be drawn. The figures obtained have been recorded, since they may perhaps stimulate further enquiry; these relate, of course, only to the clinical cases and to those from the boys' school. The headings under which symptoms are listed are drawn from the grouping in the report on maladjusted children, and tabulated against these are the omissions and additions which are regarded as of possible significance. This is recorded, together with the totals of symptoms, in Table VII. One feels that some of these relationships are worth following up in a specialized enquiry, but that more than that cannot be said. Also recorded is a tabulated list of those "disturbed" children who produced houses approximately "normal", together with their sex, age, intelligence level (assessed either on the Wechsler-Bellevue or the Terman Merrill Scale), their symptoms and any relevant factors in the history of the child. Of these there is a total of 26. Considering some of the common behaviour symptoms first, we find that of a total of 60 pilferers 10 produce normal houses and 50 abnormal ones, a ratio of 17 : 83 per cent.; of the children who have "tempers" the figures are a total of 29, 4 producing normal houses and 25 abnormal, 14 : 86 per cent.; of those who truant or are out of control, of a total of 31, 6 produce normal and 25 abnormal houses, or 19 : 81 per cent. When, however, we come to the habit disorders, again taking the commonest symptoms, we find that disturbed movement, varying from thumbsucking and nail-biting to tic-like movements, of a total of 37, 5 produce normal houses and 32 abnormal houses, which is approximately the same ratio as for tempers, 14 : 86 per cent. However, the common symptom of enuresis produces a different figure. Of these there are a total of 44, 4 of whom produce normal and 40 abnormal houses, a ratio of 9 : 91 per cent. Those with sleep disturbances, of a total of 30, 2 produce normal and 28 abnormal houses, 7 : 93 per cent.

The same kind of ratio obtains with the commoner symptoms under nervous disorders. Of those who have "fears", 90 per cent. produce abnormal houses, of the solitary, 91 per cent., of the ones showing compulsions, 88 per cent., and of those who are labelled timid, all produce abnormal houses. Of those labelled restless, over-active, excitable, however, this is not true, only 80 per cent. producing abnormal houses.

It is perhaps worth noting that all the "dull" children (I.Q.s under 80) produce normal houses, with the exception of one who produced no outside structure and one who "personifies" his house (Fig. 2). Of those who have "fears", 6 have no door handle, possibly a protective mechanism, and 4 no

TABLE VII

Symptom	Total	Male	Female	Floor	Chimney	Door	Handle	Upper Window	Lower Window	Structure to Window	No Outside Structure	Addition of Drainpipe
		113	35	38	26	8	51	11	13	47	36	14
Nervous disorders:												
Fears	19	10	9	4	2	1	6	—	—	2	—	2
Timidity	7	7	—	3	—	—	1	1	1	1	—	—
Compulsion	7	6	1	1	1	1	2	—	1	1	—	—
Solitary	10	9	1	4	2	—	3	1	1	—	4	1
Depressed, inhibited emotions ..	3	3	—	—	—	—	1	—	1	1	2	—
Excitable, overactive, restless ..	8	7	1	3	2	2	3	—	—	3	1	—
Hysterical phenomena	4	3	1	—	—	—	—	—	—	—	—	—
Habit disorders:												
Stammering	1	1	—	—	—	—	1	—	—	—	—	—
Sleep disorders	28	18	10	6	3	2	14	1	1	9	5	—
Psychosomatic condition	8	6	2	2	—	1	4	—	1	2	3	1
Disturbed movements	32	22	10	6	4	5	16	—	1	4	4	1
Enuresis	40	34	6	12	6	2	11	—	1	4	10	3
Encopresis	15	14	1	1	2	1	3	—	—	1	1	1
Physical symptoms	3	1	2	2	—	—	—	—	—	—	2	—
Behaviour disorders:												
Jealousy	14	10	4	4	—	1	3	—	—	1	1	—
Refusal to go to school	2	—	2	—	1	—	1	—	—	—	—	—
Tempers	25	22	3	3	2	1	9	2	1	4	4	3
Beyond control, truanting, wandering	25	25	—	1	3	1	6	1	—	4	7	—
Destructiveness	16	13	3	4	3	—	7	—	—	5	8	—
Sex difficulties	11	8	3	2	2	—	5	—	—	4	1	1
Pilfering	50	46	4	7	3	2	14	—	1	7	10	2
Lacks concentration, day-dreaming ..	8	4	4	1	—	—	—	—	—	—	2	2
Educational disorder:												
Educational backwardness	10	10	—	4	2	—	4	—	—	1	4	1
Dullness	9	3	6	—	—	—	—	—	—	—	1	—
Organic conditions:												
Epilepsy	5	2	3	1	1	1	—	2	1	1	—	—
Post-concussive syndrome	1	1	—	—	—	—	—	—	—	—	—	—

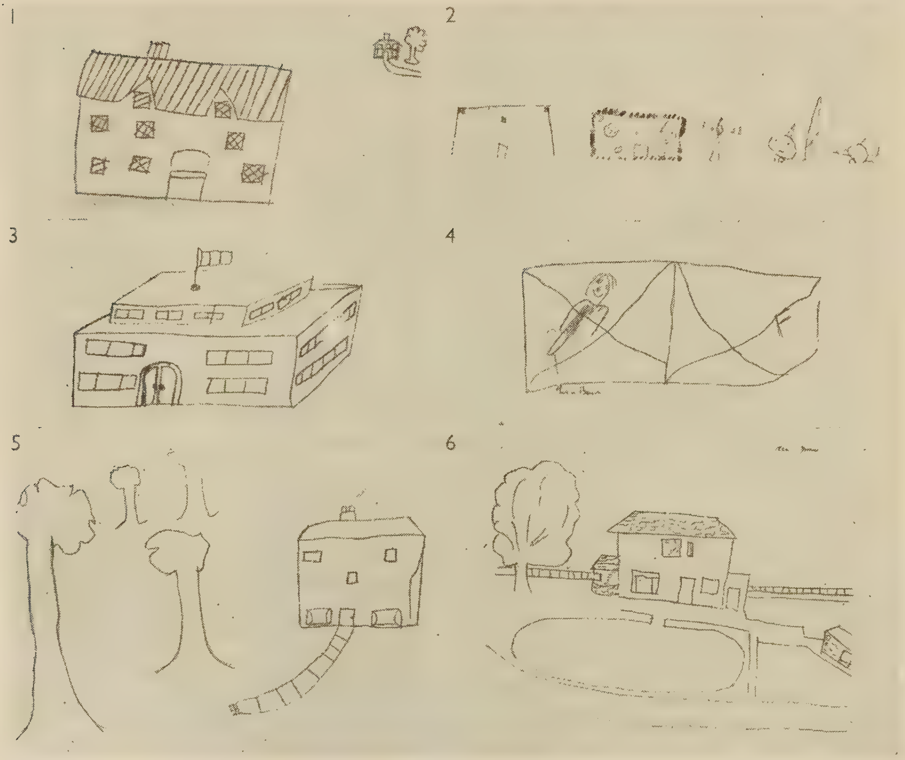
TABLE VIII

	Sex	Age yrs.	Age ms.	I.Q.	Symptoms	Relevant Details of History
1	M	11	8	88	Nail-biter; headaches.	Post-concussion; difficult birth; bottle-fed. Relations between parents poor; relationship between patient and mother poor.
2	M	9	10	80	Enuresis; tempers.	Illegitimate; bottle-fed.
3	F	10	3	89	Epilepsy.	Difficult birth; bottle-fed.
4	M	9	5	125	Pilfering.	Premature; bottle-fed.
5	M	12	0	74	Eczema; truanting.	Rejected by mother; relationship between mother and patient poor; bottle-fed.
6	M	12	0	75	Truanting; pilfering; enuresis.	In a children's home.
7	M	13	10	89	Compulsive thinking.	Nothing abnormal obtained.
8	F	8	9	100	Temper; destructive.	Illegitimate; adopted; adoptive father in mental hospital.
9	F	7	10	NT	Jealousy of sister.	Early separation from mother, later father. Adopted.
10	F	14	4	72	Negative; lying.	Extremely complicated irregular family situation; early separation from parents.
11	F	13	0	NT	Epilepsy; lying; pilfering.	Separated from father, parents separated; relationship with mother difficult.
12	M	11	9	112	Pilfering; solitary; inhibited.	Relationship between parents poor.
13	M	14	7	93	Anxiety about "something wrong with him".	Early separation from father; bottle-fed.
14	F	8	0	108	Difficulty in sleeping; fears; nightmares; nail-biter.	Separated from mother between 2 and 5 years; rejection by mother; difficult birth; bottle-fed.
15	F	8	0	118	Tempers; nail-biter; urticaria.	Poor relationship with father.
16	M	7	9	95	Soiling; wetting; restless.	Separated from mother in 2nd year and later; difficult relationship with mother and father; conceived out of wedlock; premature birth; mother a very dishonest person.
17	M	7	6	72	Pilfering; jealous of sister.	Difficult relationship between parents; poor relationship with father and sister; initially rejected by mother; premature birth.
18	M	14	0	84	Alopecia; jealousy; temper; sleep disturbance; destructive.	Born out of wedlock.
19	F	10	7	121	Pilfering; fear of dark.	"Displaced person"; illegitimate; separated from father who died in Germany; unhappy relationship with stepfather's people in this country.
20	M	7	1	95	Pilfering and wandering.	An impossibly complicated series of irregular relationships; deserted by own mother.
21	M	11	11	121	Enuresis; encopresis; thumbsucker; destructive.	Never had a settled home; in Children's Home and later adopted by grandmother.
22	M	10	6	112	Out of control; very restless.	Separated from mother in first 6 months and again later, from father after 5 years. Adopted.
23	M	12	7	158	Pilfering and destructive.	Separated from mother between 6 months and 2 years; father dead; reported unstable.
24	M	13	4	110	Pilfering; running away; nail-biter.	Early separation from mother; bottle-fed.
25	M	10	4	123	Pilfering.	Early separation from mother, later from father; in Children's Home; parents separated.
26	M	12	5	NT	Pilfering; truanting.	Poor relationship between parents; father in prison for theft.

floor, already suggested as a possible evidence of insecurity; that the solitary children tend also to omit floor, door handle, and outside structures; that 50 per cent. of the children whose sleep is disturbed also omit the door handle, and that the next highest figure, 9, is approximately 33 per cent., while rather less than 25 per cent. omit the floor. Finally, relatively speaking, the children with behaviour disorders show far fewer abnormalities of structure.

Perhaps this group of figures is sufficient to show that there appears to be a difference in the nature of different groups of symptoms, again with the suggestion that the behaviour disorders are relatively more "normal" disturbances in a child's life. Referral for tempers, truanting and pilfering may indeed represent the parents' anxiety rather than the child's abnormality, for it could well be true that any one of us could exclaim, "There, but for the grace of God, go I".

As a matter of interest and speculation there are included, finally, reproductions of a selection of the more abnormal houses, and summaries of the case histories.



Figs 1-6.

FIG. 1.—This first illustration is from the daughter of an interested colleague. This normal and intelligent child of 12 was asked by her father to draw him a house. She produced the central building and then spontaneously drew the one at the side, saying "This is the house I always used to draw."

FIG. 2.—F., 7 years 10 months. I.Q. 78. Middle of 3. Brother 10, sister 3.

Wanted child. Pregnancy normal. Full-time normal birth. Mother very unhappy because father away from home, living with her mother with whom she does not get on. Breast-fed 3 months, no difficulty with weaning. Milestones normal.

Mother also very dull relative to her husband, very anxious and feels inferior relative to husband and his family, resents patient because she is like herself.

Patient is a poor mixer, gets into tempers, jealous of her sister who is much brighter.

Referred for backwardness and being sensitive about her physique, especially her long legs.

Drawing—a house—the outstanding feature of which is the personification of all the structures and the second, very blank house, both chimneyless.

FIG. 3.—M., 12 years 11 months. I.Q. 96.

This boy was the eldest surviving child in the family, there having been one miscarriage before him, two following him, then a brother 3 years younger, two further miscarriages and another brother seven years the patient's junior.

The mother admitted to frigidity. She was well in the pregnancy and he was a normal, full-time baby, breast-fed, with an initial difficulty in sucking. Late in talking, but otherwise developing normally. Enuretic at night till eight. Stammer for a year after starting school. Takes a long time to get to sleep and occasionally walks in his sleep.

Was placed in a residential nursery between 18 months and 2 years, not visited, did not know his parents when they came.

Affectionate and dependent in relationship with mother. Father has little patience with him. Parents are practising Quakers. Father gets annoyed with patient and then apologizes. The patient has been in two Quaker schools and brought up with the idea of wickedness of war and violence.

Referred for failure at school, lack of concentration, resistance to all order and discipline.

Invited to draw, produces first a bus, and then, when asked for a house, the above structure, which he described as a *French Foreign Legion Fort.*

FIG. 4.—M., 5 years 6 months. I.Q. (N.T.).

A child from a Children's Home who had been in care since less than two years.

No history obtainable, not regarded as especially dull. Very unwilling to draw and needed a lot of encouragement to start. Extremely withdrawn and unwilling to make contact.

The house—starts with three sides, left wall much later. Forgets what he is doing and proceeds with a series of diagonals. The figure is his twin brother, the initial letter F refers apparently to his own name.

FIG. 5.—M., 8 years 6 months. I.Q. 104. Younger of two children, sister aged 10.

Pregnancy normal except for some vomiting. Normal birth, 10 days overdue. Breast-fed 10 days, no subsequent feeding difficulty. Normal milestones. A thumb-sucker. Takes a long time to go to sleep.

Maternal grandfather has lived with them some years, difficult and bedridden, recently died suddenly. Patient disturbed by grandfather and more by his death.

Referred from Paediatric Department, ataxic, afraid of dying, crying and depressed. No evidence of physical disease.

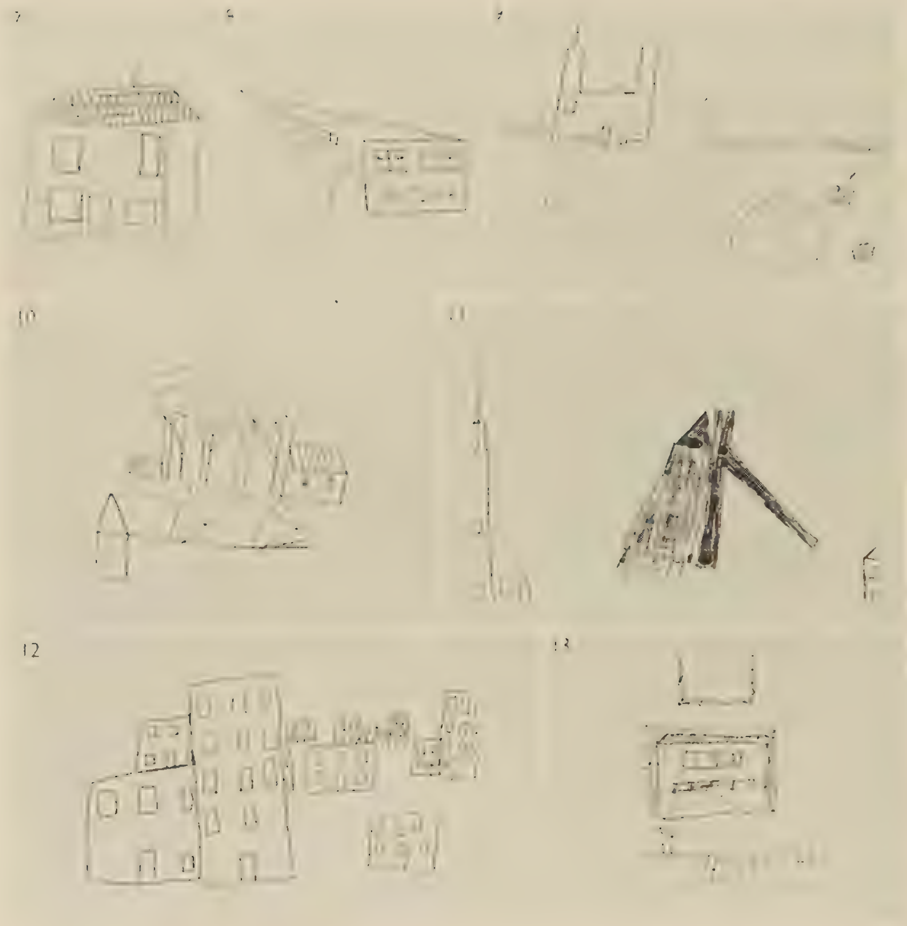
Invited to draw, produces a dream—a man shooting at him in bed. *The house* started with the trees, then the house, with blank windows, then path and gate.

FIG. 6.—F., 11 years 10 months. I.Q. 120. Younger of 2. Brother 11 years older.

Unwanted. Parents felt they could not afford another child. Pregnancy rejected. Mother continued to work to 7 months. Full-time normal birth. Breast-fed 6 months. Milestones normal. Marital situation unhappy. Father drank to excess, died recently.

Takes a long time to go to sleep, has a habit of holding her nostril to breathe more easily. After starting school was enuretic during day for about 6 months.

Referred for multiple fears and attacks of "hysterical hyperventilation". Invited to draw produces first "the seaside, with steps going down to the beach". Then house. First the enormous bow-window (left), then the house, with no chimney and no means of opening the door, irregular windows. (It was felt that the bow-window referred to her feeling about breathing and the need to push out her own chest.)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Figs. 7-13

FIG. 7.—M., 10 years 7 months. I.Q. 135. Only child.

Parents married 12 years before the birth, the only pregnancy.

Normal pregnancy, difficult birth (mother 38). Refused to suck and breast given up on this account. No difficulty with bottle. Milestones early.

Difficult about his food, and a poor mixer, negative towards mother. Father died recently, cancer of the throat, patient very disturbed by his death. Mother's brother died in a mental hospital. Mother appeared cold and rejecting.

Referred for laziness at school, shows no sign of achieving grammar school place.

Draws (1) a racing car; (2) a house, showing over-elaboration of roof and completely blank windows and strongly marked drainpipe.

An odd mixture of under and over-elaboration, and a standard of production unrelated to age and high intelligence.

FIG. 8.—M., 13 years 10 months. I.Q. 96.

Younger of two—older brother 16+—one miscarriage between.

Unwanted pregnancy. Mother 44. Full-time birth, mother says she was in labour a fortnight. Breast-fed 18 months to 2 years, difficult to wean. Milestones slow. Walking 2 years, talking not till 5, easy to train but relapsed and is still a bed-wetter. Sleeps normally, appetite enormous, will eat a 2 lb. loaf at a meal. A nail-biter, afraid of the dark, chews paper, violent tempered. Father is also violent tempered and both he and the older brother are under psychiatric care. Referred for taking an overdose of tablets, but had previously been on the list for "educational backwardness" and his reading age is 6 years 5 months.

Drawing 1. A jet-plane attacking an aircraft carrier.

Drawing 2. House—described by him as a row of houses—note absence of structure to any but the first and the lack of chimney.

FIG. 9.—M., 8 years 1 month. I.Q. 105.

The eldest of three brothers, the two younger boys being 7 and 6.

Taken into care at age 3 and in a Children's Home. Later boarded out and was in his third foster home at time of referral. The immediate foster parents have two children of their own and expecting another.

Details of early history unobtainable.

Referred for pilfering, including useless objects such as a Crucifix, and lack of affection and of response to affection.

Drawing—a scene, the outstanding feature of which is a large, almost windowless church, and a very diminutive and unsteady-looking house.

FIG. 10.—M., 10 years 8 months. I.Q. 124.

Third of a family of 5, 2 older brothers, 12 and 13, 2 younger sisters, 6 and 4+.

Pregnancy normal. Full-time, normal birth. Bottle-fed. Father away in service till patient 2. Milestones normal except for toilet training, a spasmodic soiler and bed-wetter till 5. Sleep poor, takes a long time to get off and has nightmares. Has twitching habits.

Mother has gone out to work periodically since child 1 year.

Referred for pilfering, with which parents would seem to have sympathized.

Drawing 1. A figure—Sir Walter Raleigh; 2. The house—this has no door, a chimney like an engine, probably associated with a basement structure of the school in which he is resident. The start of a more normal house, which was abandoned, below.

FIG. 11.—M., 10 years 5 months. I.Q. 117. Second of 3. Sister 11+, brother 11 months.

Pregnancy wanted, but during which husband reported "missing". Did not return home till patient 11 months. Child 3 weeks premature. An easy birth. Breast-fed 8 months, no weaning difficulties. Milestones normal except for toilet training, a persistent soiler and wetter by day and night.

A restless sleeper—talks a lot in his sleep. A nail-biter and thumb-sucker, chews coat lapels and handkerchiefs, very restless. Some evidence of instability of minor kinds in the family. Referred for backwardness at school, lacking in personal control, dirty habits, and easily led. Drawing—a rocket ship, fired by jets, two "half" houses on either side. Note the ship also has the appearance of a battlemented house.

FIG. 12.—M., 11 years 2 months. I.Q. 99.

Details of early history unobtainable; parents quarrelled and were divorced before patient was 5. Patient first in care of paternal aunt, later in foster home. Returned to father at 8+. The third of 5, two older sisters, one brother younger and one sister. Father obviously anxious to get rid of patient, and was reported himself as dishonest.

Referred for enuresis, encopresis, nightmares, hostility to adults. ? Organic syndrome.

1. Drawing of driverless, windowless van, a half-tree and much smaller whole one.
2. House—a series of structures, with completely blank windows and doors and no chimneys or outside features.

FIG. 13.—M., 11 years 5 months. I.Q. 117. Illegitimate; adopted at 10 days.

Bottle-fed. No feeding or weaning difficulties. Milestones normal. Adoptive mother angry at refusal to go out with adoptive parents, great difficulty about clothes, won't wear a pair of darned socks, becomes violent if crossed in this matter, refused to sit at table with adoptive parents. Pilfering.

Drawing—a water-bottle, copied from the table at which he sat.

House—this odd structure is supposed to be a house, looked at through a window.

SUMMARY AND CONCLUSIONS

1. A study of the drawings of children in diagnostic sessions is recorded, together with controls from ordinary schools, representing different age groups.

2. The drawing of houses is shown to be related to the emotional and possibly also to the intellectual development of the child.

3. The way in which the "house" is "built" has been tabulated showing that there appears to be a norm. This is also related to the omissions and additions which feature.

4. An attempt is made to relate different symptoms to the abnormalities of structure, and to assess these in relation to those clinical cases who produce "normal" houses.

It is felt that the figures produced suggest very strongly that the house is a spontaneous drawing only in normal children between 5 and 8 years, thereafter it suggests emotional immaturity; that the normal structure has been demonstrated, and that there are figures produced relating to symptoms and structure which are suggestive enough to be worth following further.

ACKNOWLEDGMENTS

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SOME OBSERVATIONS ON HUNTINGTON'S CHOREA*

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THE first distinctive account of this condition was given by George Huntington, a physician of Long Island, in 1872. Since then our knowledge regarding aetiology has not advanced greatly, though the hereditary nature of the illness and the fact that it is transmitted as a Mendelian dominant by both sexes has been established.

Histological examination has revealed the physical basis of the disease to be degenerative changes in the cerebral cortex, basal ganglia, subthalamic region and brain-stem (Denny-Brown, 1946). A mass of statistics has been accumulated regarding the geographical distribution, the age of onset and the incidence of the disease in the population (Davenport and Muncey, 1916; Critchley, 1934; Minski and Guttman, 1938). The incidence in England and Wales has been calculated by Pleydell (1954) as 6·5 per 100,000 population, giving an estimated total of 2,600 cases.

Therapeutic progress has been hampered by lack of knowledge regarding aetiology. Naturally with an hereditary disease prevention is the ideal and a strong plea for eugenic control was made by Spillane and Phillips (1937). Reid and Palm (1951) produced statistical evidence to suggest that not only do choreics usually marry before symptoms appear, thus nullifying the effects of natural selection, but also that they are on the whole more fertile than their non-choreic siblings. As regards symptomatic treatment, there was little advance until 1952, when Goldman reported favourably on the use of procaine amide. In 1955 the use of reserpine was reported (Lazarte *et al.*) and also the treatment of two cases of Huntington's Chorea with B.A.L. (Neilson and Butt). It should be mentioned that these treatments were directed primarily against hyperkinesis rather than the mental state of the patient. This paper presents some observations on these various forms of symptomatic treatment and also the results of some biochemical investigations.

MATERIALS AND METHODS

First Trial

Four patients were selected for this trial, the mean age being 50·4 years and the range from 48 to 54 years. These patients were all female and all had a strongly positive family history. In two patients the illness was advanced; they were more or less restricted to bed on account of severe ataxia and were incapable of intelligible speech. The other two were up and about but showed well-marked arm and trunk movements. It was intended to run a double blind controlled trial of reserpine using a finger dexterity test as an index of improvement. This test consisted of a wooden board with 24 holes in it into which had to be fitted 24 wooden pegs (the apparatus was designed by the occupational therapists). Six "normal" subjects were tested and were found to take 1 minute (±10 seconds) over the test. Preliminary trials with three of the Huntington's Chorea patients gave scores ranging from 2 to 10 minutes. The other patient (B.B.) was incapable of doing the test. Another patient later refused to do the test and these two patients (C.M. and B.B.) had therefore to be scored on the number of involuntary movements observed over timed periods of two minutes each day. The other two patients (E.M. and C.R.) were given two runs of the test each day and the mean of these two times was taken for the daily scores. From these daily figures weekly mean scores were obtained for the period of the trial. For the first period of three weeks each patient received procaine amide, starting with 1 g. daily and working up over 5 days to 1 g. q.d.s. During the next three weeks two patients received reserpine 1 mg. t.d.s. and the other two identical placebo tablets. The drugs were then reversed during the following three weeks and during the last week of all, all drugs were withheld.

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* Based on a paper read at the Winter Meeting, Scottish Division, R.M.P.A., held at Bangour Village Hospital in December, 1956.

Second Trial

Subsequent to the controlled trial two patients (C.M. and B.B.) were put on larger doses of reserpine (2 mg. t.d.s.). A film was taken during this period of C.M. for comparison with one taken in the pre-trial phase. Two other patients (E.M. and C.R.) were treated with reserpine (1 mg. b.d.) and Meratran (pipradol hydrochloride) 1 mg. daily. After a month the drugs for these four patients were withdrawn for a period of three weeks as a means of evaluating their effect on the patients' hyperkinesis. The drugs were then re-introduced in the same dosage as before. Finally three additional patients in other wards were tried on reserpine 1 mg. t.d.s.; of these two patients are still on the drug while in the case of the other patient the drug had to be withdrawn on account of side-effects. Details of all seven patients are given in Table I.

TABLE I

Patient	Age (years)	Sex	Family History	Duration of Illness	Response to reserpine
E.S. ..	51	F.	Negative	10 years	Improved
B.B. ..	48	F.	Positive	12 years	Improved
E.M. ..	48	F.	Positive	5 years	Improved
C.R. ..	54	F.	Positive	4 years	Improved
C.M. ..	51	F.	Positive	7 years	Improved
J.B. ..	54	M.	Negative	53 years	Side effects—drug withdrawn
G.W. ..	54	M.	Positive	10 years	No change

RESULTS

First Trial

The results of this trial are shown in Figures 1–4. In two patients (Figs. 1 and 2) there is evidence of diminished hyperkinesis while on reserpine. These two were the most severely incapacitated and were scored by direct observation. The other two scored by the finger dexterity test showed no very definite response to reserpine. One patient (B.B.) appeared to improve on procaine amide. Since then this observation has not been confirmed, though a further course of procaine amide was administered.

Second Trial

Though the film of C.M. showed little change in the amount of hyperkinesis compared with the pre-trial film, yet it seemed that both C.M. and B.B.

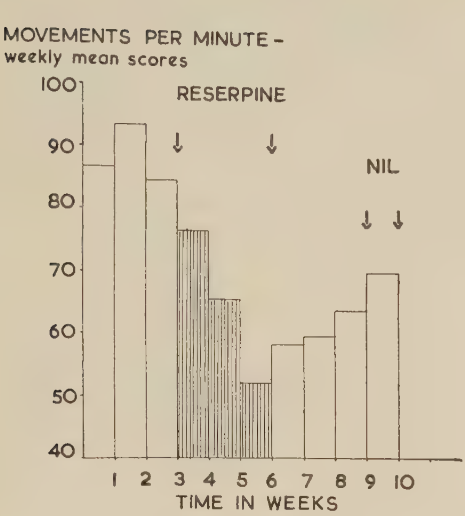

FIG. 1

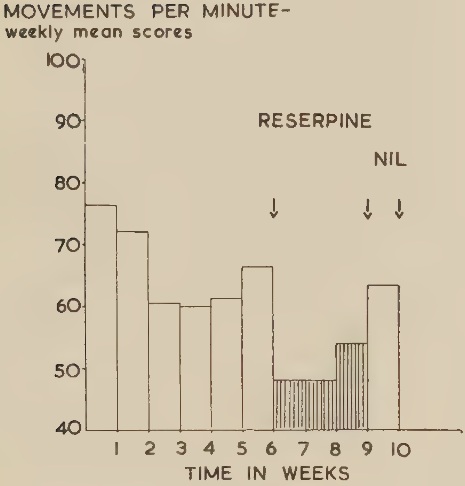

FIG. 2

showed the maximum improvement on the larger dose of reserpine (2 mg. t.d.s.). Similarly E.M. and C.R. seemed to be at their best on the reserpine-Meratran combination. The increase in the amount of hyperkinesis that was observed during the blank period when all drugs were withheld convinced the nursing staff that the patients were benefiting from their drugs. Particularly the staff commented that these patients were much less pleasant and co-operative when the drugs were withheld. Of the other three patients only E.S. showed improvement. G.W. has dyslalia rather than involuntary limb movements as his chief symptom. He did not show any significant improvement. J.B. complained of intermittent nausea, vomited twice and was troubled by aching pains in the legs and trunk. The reserpine was continued for three weeks in spite of these adverse symptoms but was then withdrawn as there had been no appreciable change in the amount of involuntary movement observed.

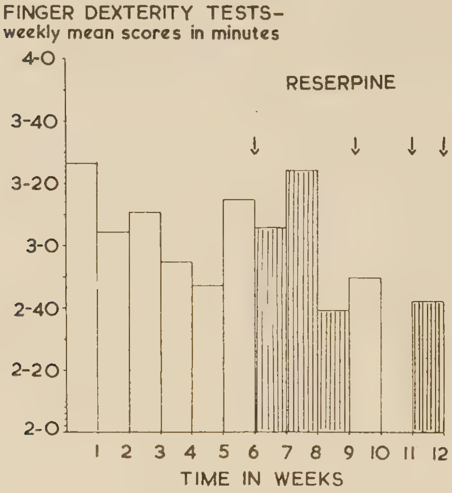

Fig. 3

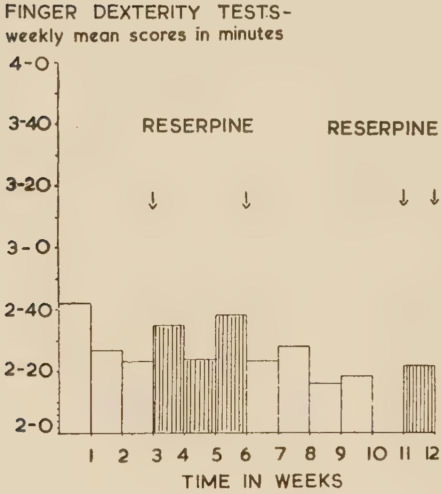

Fig. 4

Biochemical Investigations

The serum copper levels in the first four patients were compared with values obtained for eight non-choreic controls (four normal volunteers, four schizophrenic patients). All the results fell within the normal range. Twenty-four hour urine specimens were then collected (using suitable precautions to avoid metallic contamination) and the copper content estimated. These results also fell within the normal range (see Table II).

As it had been noted that the trial patients seemed to show more hyperkinesis before meals than afterwards it was postulated that low fasting blood sugars might be related to this phenomenon. Accordingly the fasting blood sugar was estimated in six patients and in two patients glucose and insulin tolerance curves were also performed. The only abnormal result was the insulin tolerance curve in case B.B., the blood sugar falling from a fasting level of 78 mg./100 ml. to 17·5 mg./100 ml. at 1 hour and 42 mg./100 ml. at 2 hours (0·1 units soluble insulin per Kg body weight). It was felt that this finding might reflect hepatic deficiency and liver function tests were therefore performed in seven patients. In two patients the flocculation tests were abnormal (B.B.: thymol turbidity 3 units, thymol flocculation +ve, serum colloidal gold 4 units; E.S. thymol turbidity 6·5 units, thymol flocculation +ve, zinc turbidity 11·0 units, serum colloidal gold 4 units). The serum proteins and serum bilirubin levels were within normal limits.

TABLE II

Patient	Fasting Blood Sugar (Per cent.)	Serum Copper (Per cent.)	24-hour Urinary Copper Excretion	Liver Function Tests
G.W.	85 mg.	—	—	Normal
J.B.	—	—	—	Normal
E.M.	77 mg.	150 mcg.	22 mcg.	Normal
C.R.	89 mg.	130 mcg.	28 mcg.	Normal
C.M.	74 mg.	130 mcg.	26 mcg.	Normal
E.S.	67 mg.	—	—	Hepato-Cellular Damage
B.B.	70 mg.	160 mcg.	11 mcg.	Hepato-Cellular Damage

Finally the urine was examined for amino-acids (3 patients) and for indole excretion compounds (7 patients). No abnormal amino-acids were found in the urines examined. Early morning urine specimens from seven patients were examined for urinary indoles using a technique based on that described by Jepson (1955). Urine was examined both before and while the patients were under treatment with reserpine. The confirmatory tests used for serotonin (5-hydroxy-tryptamine), indole-acetic acid and 5-hydroxy-indole-acetic acid were the same as those described by Jepson in the article already quoted. The results of this investigation are shown in Table III. Urea and Indoxyl sulphate, which are normal urinary constituents, were found in each case and have not been included in the Table.

TABLE III

Patient	Receiving Reserpine?	Indoles Detected in Urine				
		5–H.T.	Trypto-phane	5–H.I.A.A.	I.A.A.	I.L.A.
C.M.	No	+	+	−	+	+
	Yes	+	+	−	+	−
B.B.	No	+	+	+	+	−
	Yes	+	+	−	+	−
C.R.	No	+	+	+	−	−
	Yes	+	+	−	−	−
E.M.	No	+	+	−	−	−
	Yes	+	+	−	−	−
E.S.	No	+	+	+	+	−
	Yes	+	+	−	+	−
G.W.	No	+	+	−	−	−
	Yes	+	+	−	−	−
J.B.	No	+	+	−	−	−

DISCUSSION

It should perhaps be made clear that the scoring techniques used in the drug trial were found to give a retesting error of plus or minus 10 per cent. Thus the figures have no absolute validity, but owing to the nature of the trial should provide an adequate measure of the difference between one phase of the trial and the next. If this is accepted then the first trial demonstrated that reserpine produced a significant reduction in the amount of hyperkinesis in two of the four patients tested. In fact the phase in the second trial when the drug was withdrawn was much more impressive. All observers were agreed that the patients were worse without their drugs. For milder cases reserpine plus Meratran seems a satisfactory combination. The findings reported here confirm those of other workers (Lazarte *et al.*, 1955; De Myer and Dyker, 1954) that procaine amide is without significant effect in reducing the hyperkinesis. In view of the negative findings regarding copper metabolism it has not been thought justifiable to try the effects of B.A.L. In fact there seem to have been no reports in the literature confirming the observations of Nielson and Butt (1955) regarding the efficacy of B.A.L.

It is difficult to assess the significance of the biochemical abnormalities discovered. Dr. Easson, who very kindly arranged for most of the biochemical tests to be performed, is satisfied that the liver function test abnormalities in cases of B.B. and E.S. are significant and indicative of cellular damage. It does not seem likely that dietary deficiency can explain these findings or the increased insulin sensitivity in the case of B.B. In fact it was striking what voracious appetites these patients had. The association between advanced liver disease and involuntary movements of extra-pyramidal type is now well known (Sherlock, 1956). It seems possible that further investigations into the liver functions in cases of Huntington's Chorea might be rewarding. It is even more difficult to decide the significance of the findings regarding indole excretion patterns in the seven patients examined.

Jepson (1955) in the paper quoted above suggested that 100 microlitres of normal urine would show very little in the way of indoles apart from indican, a trace of I.A.A. and an occasional unidentified spot. In fact the volume of urine used in these chromatograms was 60 microlitres though it should perhaps be emphasized that early morning samples were examined. In the course of another investigation samples of urine from patients in a general medical ward have been examined using the same technique. So far 55 samples have been examined and 17 (30·9 per cent.) were found to contain detectable amounts of serotonin. This is in keeping with the observations of Rodnight (1956) who found that the 24 hour excretion of serotonin in 12 normal adults ranged from 45 to 120 mcg./24 hours. On the other hand, Boyland *et al.* (1956) found no serotonin in the urine of 16 normal subjects even after the ingestion of 2 g. of L-tryptophan. One point of interest arising from this investigation was that 5-hydroxy-indolyl-acetic acid (5-H.I.A.A.) was detected less frequently than serotonin (5-H.T.) which is perhaps surprising as 5-H.I.A.A. is thought to be the normal excretion product of serotonin. The other point of interest is that there was no constant alteration in the indole excretion pattern during treatment with reserpine.

SUMMARY

A controlled clinical trial of reserpine in four cases of Huntington's Chorea showed significant improvement in two cases. A more extended trial of reserpine in a total of seven cases of Huntington's Chorea showed some degree of reduction in hyperkinesis in five patients.

Procaine amide was tried in four patients and was not found to be effective. A series of biochemical investigations on these seven patients have been reported and the possible significance of the findings discussed.

ACKNOWLEDGMENTS

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PSYCHOMETRIC ASPECTS OF HOMOSEXUALITY*

By

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INTRODUCTION

HOMOSEXUALITY presents one of the most controversial social problems, loaded with preconceived opinions, moral values and *a priori* rather than empirical solutions. According to the varying philosophies concerning its genesis, different methods of treatment are advanced: social action, legal sanctions, physical treatment and psychotherapy. Objective and well-controlled research is rare, partly owing to difficulties in assessment and measurement. Psychological tests have been used in the diagnosis of homosexuality and in researches concerned with this problem, and it is the aim of this paper to discuss some attempts at measuring the psychological characteristics of the homosexual, and the direction and intensity of his impulses.

Psychometric aspects of homosexuality involve several distinct aims. In particular, psychologists have attempted:

(*i*) To measure the direction of sexual attraction, the tendency to be attracted to people of the same sex instead of the other sex;

(*ii*) To discover the characteristics of the homosexual's attitudes, behaviour and perception, and particularly to find specific elements which will indicate that a person is a homosexual;

(*iii*) To isolate various psychological and cultural aspects of masculinity and femininity, and to measure these aspects; this approach is based on the assumption that masculine women and feminine men are basically homosexual whether their characteristics are the cause or the effect of homosexuality;

(*iv*) To understand the dynamic aspects of homosexuality, to discover those elements in the personality or environment of the homosexuals which may be regarded as causing sexual inversion. This last endeavour is perhaps the most difficult and according to some methodologists entirely futile; it has been criticized on the grounds that in psychology we cannot really establish any causal relationships. On the other hand it is probably the most important approach, as it is the one from which practical implications in terms of treatment can follow.

From the point of view of technique, testing devices can be divided into the following main groups:

(*i*) Questionnaires which distinguish between masculinity and femininity in terms of statements with which men and women agree or disagree. Such statements involve interests, attitudes and opinions which are believed to be characteristic of the male and female populations respectively. Men endorsing the groups of statements usually endorsed by women and failing to endorse the statements usually endorsed by men are said to be homosexual. A similar assumption is made about women who endorse a masculine outlook.

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* Based on a paper read before the joint meeting of the Medical and Social Psychology Sections of the British Psychological Society on 21 November, 1956.

(*ii*) Semantic tests, which analyse the subject's vocabulary (apparently on the assumption that men and women do not always speak the same language).

(*iii*) Projective tests which involve specific creative activity on the part of the subject.

(*iv*) Perceptual tests, also mainly projective in nature, in which standard stimuli are presented to the subject. Men and women are believed to differ in their perception of the stimuli, and homosexuals are said to have their own peculiarities.

(*v*) Projective tests which involve personal relationships. These are said to reveal a person's attitudes, identifications and complexes, and his perception of the relationships between parents and children, and between people of the same and of different sexes and ages.

(*vi*) Finally, tests which measure personality in developmental terms, in particular certain aspects of masculine and feminine identifications, and of narcissism.

PERSONALITY INVENTORIES

It would be impossible to summarize here all the personality questionnaires which have become so numerous lately, but the following examples will illustrate this type of approach.

Basically all these questionnaires contain a number of statements and the subjects are asked to indicate whether the statements, as applied to them, are true or false. The inventories are essentially empirical in nature, that is they have no underlying theory, and the statements are selected on the basis of the frequency of their endorsement by criterion groups or on the basis of factor analysis. In the case of masculinity-femininity scales criterion groups are usually contrasted samples of men and women, and the subject who marks as true statements often endorsed by men and marks as false statements usually endorsed by women is regarded as masculine in his interests and outlook.

Among the inventories now used in clinical practice the most popular is probably the Minnesota Multiphasic Personality Inventory (Hathaway and McKinley, 1943). There is a vast literature on its uses and abuses, and conflicting results about its factorial composition and validity have been reported (Cook and Wherry, 1950; Gough, 1946; Guthrie, 1950; Loevinger, 1955; Morris, 1946; Tyler, 1951; Wheeler, Little and Lehner, 1951).

The masculinity-femininity scale of the M.M.P.I. gives a peculiar picture of supposedly masculine characteristics.*

A "typical" male comes out as a cynical opportunist, prejudiced and superstitious, spiteful and revengeful, tough and cruel to animals, a slow thinker but quick to start a fight, enjoying primitive pleasures and having no manners. By contrast, an effeminate man (or a woman) is sentimental, has aesthetic, artistic and cultural interests, is concerned with feelings and has insight into them, but also suffers from phobias, anxieties and worries.

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* A masculine man is supposed to like to be "tipped off" about people with whom it pays to be friendly, to keep his mouth shut when in trouble, to pay back anybody who has wronged him, to believe that fear is the mainspring of honesty and self-advancement the basis of friendship, to be careful to step over sidewalk cracks, to be a slow learner, to enjoy teasing animals, etc.

In spite of the empirical basis of the test one cannot escape a suspicion that the above pictures represent stereotypes rather than reality. They are, moreover, Mid-Western American stereotypes which follow the familiar pattern of cultural superiority of the female sex. It seems that the masculinity-femininity scale has been so loaded with cultural factors that people with high intelligence and good education are bound to appear rather effeminate in the test profiles. Nor is it surprising that in a recent large-scale research (unpublished) the M.M.P.I. masculinity-femininity scale was found not to be significantly correlated with either masculinity or femininity in style, manner and behaviour, while femininity showed a correlation of ·38 with intellectual interests and ·50 with concern with philosophical problems.*

Some of the weaknesses of the M.M.P.I. scale have been avoided in the development of the Psychological Femininity Scale of the California Personality Inventory. In this project (Gough, 1952) some 500 items were sifted in order to determine empirically which of them differentiated male and female subjects, and the resulting scale was cross-validated on large samples of males and females.

Both sexes emerge here in a somewhat similar light to the M.M.P.I. personality types, but the picture is less exaggerated.

The cultural superiority of women and the impact of education and cultural interests on test scores are still present. The test was found to differentiate between convicted homosexuals and other criminals, with average femininity scores of 17·03 and 12·42 respectively, but by the same criterion male college students appear to be even more effeminate than homosexuals: their average femininity score is 25·95. Thus the homosexuals are 4½ points higher than other prisoners, but male college students are 13½ points higher.

This also shows the danger of choosing criminals as controls for convicted homosexuals, as the differences between the two groups may reveal not so much the peculiarities of the homosexuals as the peculiarities of the controls. One study (Burton, 1947) actually used rapists as controls for homosexuals.

While the M.M.P.I. and the C.P.I. exemplify the use of extreme groups in test construction, the Guilford-Martin Inventory of Factors GAMIN (Guilford and Martin, 1943; Guilford and Zimmerman, 1956) is a good illustration of the factor analytic approach. In this test over 300 items were used to cover various specific areas of behaviour. The inter-correlations between these items were calculated and the whole set of correlations factorized. A factor M was found to differentiate very clearly between male and female subjects, but there is so far no published evidence that this factor would differentiate between masculine and feminine men, or between masculine and feminine women. The pictures of masculinity and femininity that emerge from the items are more balanced on this test. The men are supposed to be striving for superiority but also to have some inferiority feelings, to be physically aggressive and to have mechanical and scientific interests. Women are supposed to be sentimental, to have a sense of compassion and pity, especially towards suffering animals or insects (if one is sorry for a maltreated horse or for a bird with a broken wing one is supposed to be effeminate); to be interested in social service and in literary, aesthetic and artistic activities; to suffer from phobias, anxieties and fears; to cry easily and to show disgust with dirt, loud sounds, sweat, unpleasant smells and socially disapproved habits; they are also more concerned with personal appearance.

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* In the same research the Femininity scale of the Dynamic Personality Inventory (described below) correlated significantly with femininity in style and manner of behaviour. This study was carried out in 1953 by a large team of psychologists, including the present writer, at the Institute of Personality Assessment and Research, University of California. The analysis of the data is still in progress.

One of the weaknesses of the test seems to be the rather obvious character of the items: quite a number of these items are concerned with tears and weeping, and with trembling or shaking with fear. The value of the test for determining homosexuality also remains to be established.

A fairly efficient and far less transparent tool is the masculinity-femininity scale based on the Strong Vocational Interest Blanks. This scale differentiates very clearly between the interests of men and women, and high reliability coefficients have been reported (Strong, 1936). Strong found that men show preference for mechanical, scientific and athletic activities, for legal and army occupations, for salesmanship (but not of commodities closely related to feminine interests) and for particular forms of entertainment. He found that women prefer musical. artistic and literary activities, that they are more tolerant of unfortunates: the nervous, sick, very old, crippled, foreigners, etc., but also like people who are fashionably dressed and witty. Women also have their own preferences with regard to entertainment, especially of a social character, show preference for certain buying and selling activities, for teaching, clerical and social work, and for some school subjects and hobbies.

Terman and Buttenwieser (1935) have used the Strong masculinity-femininity scale in a study of marital adjustment. This particular study did not directly concern homosexuality, but it is interesting to note that divorced women were found to have very high masculinity scores, significantly higher than those of single and married women. Divorced men were relatively effeminate while happily married men tended to have moderate scores on masculinity.

Terman and Miles (1936a) constructed a more comprehensive attitude-interest test which gives a very full picture of masculine and feminine characteristics. The test consists of a number of sub-tests. The first is a list of words each of which has several distinct meanings, some masculine and some feminine in character, and the subject is asked to select words that go best or most naturally with those on the list. Other sub-tests contain ambiguous pictures and incomplete sentences suggestive of masculine and feminine interests, lists of things that may cause anger, fear, or disgust, and of things that arouse pity, lists of acts which are socially disapproved, of occupations, types of entertainment, people with peculiar characteristics, titles of books, news items, names of famous characters and so on, and also a list of statements of the usual inventory type.

The main assets of this particular test seem to be its less obvious content and much more comprehensive character. The main drawback is its excessive length and for that reason the test has been used very little in clinical practice. This is a pity, because there is no doubt that the test is a highly sensitive instrument, able to differentiate not only between the personality traits of men and women in general, but also between specific aspects of masculinity and femininity in various social and occupational groups.

The work of Terman and Miles (1936b) shows that masculinity and femininity of interests cannot be regarded as one dimension. On the basis of carefully collected data they conclude—and their conclusion is fairly accurate for the United States even if it may not apply to some other cultures—that positive and negative masculine and feminine interests follow different patterns in the male and female population respectively. The masculine man, they say, has typically masculine interests, especially in active and mechanical pursuits: the feminine man has cultural interests. The feminine woman has typically feminine interests, especially in the arts of home and social life: the masculine woman has intellectual interests.

With respect to homosexuality itself they found that passive male homosexuals were more feminine on their test than any of the numerous groups of male subjects which they tested; but that active male homosexuals were even slightly more masculine than the average. Homosexual women were found to be significantly more masculine in their outlook, interests and personality traits than women of similar educational and social background; but female University students were just as masculine as the homosexual group, while a group of Ph.D.s and M.D.s and a group of college girls successful in athletics scored even higher on masculinity.

Some general conclusions of these authors will be referred to in the last part of this paper.

Semantic Tests

Florence Goodenough (1946) constructed a shorter test which takes advantage of one of the best aspects of the Terman-Miles test. She presents the subject with a list of homographs, that is of words which in their written form have two or more well-contrasted meanings, and asks him to associate freely to these words. The responses are classified according to their masculine or feminine character. The internal consistency of these associations appears to be good, and high split-half reliabilities have been reported. The weighted scores of male groups overlap very little with the scores of female groups, but Goodenough presents no definite evidence that the scores are related to homosexuality.

There is an English test constructed on lines similar to the Goodenough, the Selective Vocabulary Test by Patrick Slater (1944). It consists of a list of words which the subject is asked to define. The list contains two evenly matched sets of forty words, one set of words relatively known to men and unfamiliar to women, and the other complementary. The two sets correlate positively (a correlation of ·78 has been reported), but in the determination of the masculine or feminine character of the vocabulary the total vocabulary range is taken into account.

This test was specifically designed for measuring homosexuality. The author assumes that psychological differences between men and women are genetic in nature and that a test measuring the psychological traits which differentiate between men and women will also differentiate between constitutional types within one sex. He also assumes that homosexuals are constitutionally different from normal men. Slater and Slater (1947) report that the Selective Vocabulary Test differentiates clearly between samples of boys and girls of the same age, education and home background. When they compared a sample of 37 male homosexuals with a sample of 50 normal men they found that the homosexuals scored actually *higher* on the masculinity sub-test than the control group, but that their femininity score was nevertheless in excess of theoretical expectation for the given vocabulary range. Thus the homosexuals had both a higher general vocabulary level, and a *relatively* higher femininity score.

DRAWING OF THE HUMAN FIGURE

The Draw-a-Person Test has perhaps claimed more validity with respect to homosexuals than any other test. The administration of this particular device is very simple: the subject is asked to draw a person and, when he has finished, to draw another person of the other sex. An elaborate technique of scoring and interpretation has been developed by Karen Machover (Machover, 1949). She claims that male homosexuals show particular emphasis in their drawings on ears, hips and buttocks, that they draw large eyes and eye-lashes, that they put heels on the shoes of male figures, that they twist the perspective of their drawings so that one cannot tell whether it is the front or the rear of the figure, that they reveal homosexual panic in their shading of the legs or trousers or delineation of legs through transparent trousers. Most important of all, Machover claims that evidence of some degree of sexual inversion is contained in records of all individuals who draw the opposite sex first in response to the standard instructions (*ibid.*, p. 101).

There is as yet no evidence that Machover's claims are justified. Sipprelle and Swensen (1956) found no true relationship between the masculine or feminine character of the drawings and various measures of sexual adjustment. Barker, Mathis and Powers (1953) found no significant differences between homosexuals and males with negative history of overt homosexuality with respect to Machover's signs of male homosexuality. Regarding the sequence in which the drawings were made, Barker, Mathis and Powers found that over 92 per cent. of male homosexuals drew the male figure first, and another study (Mainord, 1953) has shown that among male university students about the same per cent. also drew the male figure first. For women the results are even more confusing, as out of 175 female university students only 56·6 per cent. drew the female figure first: it would be difficult to assume that over 40 per cent. of these students were homosexual. Recently (Blum, 1954) ratings based on the Machover interpretation of the Draw-a-Person Test were found to show no significant relationship with any clinical procedures such as impressionistic ratings of the same drawings, ratings obtained from a battery of psychological tests, and ratings by psychiatrists and by chief ward attendants.

A similar technique developed by Florence Goodenough (1926), essentially for measuring intelligence in small children, has been tried in a study of five groups of homosexuals, and some statistically significant differences have been reported (Darke and Geil, 1954), but in this case no proper control group of heterosexual subjects was used.

PERCEPTUAL PROJECTIVE TESTS

The Szondi test is another projective technique which claims particular validity for homosexuality. This test consists of 48 photographs of mental patients divided into six sets. Each set contains pictures of a homosexual, a sadist, an epileptic, a hysteric, a catatonic schizophrenic, a paranoid schizophrenic, a manic-depressive depressive and a manic-depressive manic. The subject is asked to choose the two cards which he likes most and the two he dislikes most in each set. On the basis of his reactions a profile is constructed and his personality described in terms of eight need-tension systems (Deri, 1949a, 1949b).

In recent years the test has been under severe attack from experimental psychologists, and empirical evaluation of the basic assumptions underlying the test has brought negative results (Lubin and Malloy, 1951). The affective valences of the Szondi pictures have also been subject to experimentation, in particular by Klopfer and Borstelmann (1951; also Borstelmann and Klopfer, 1951), who conclude that personality diagnosis *via* physiognomy is a questionable proposition.

I have used the Szondi test in a trial battery of tests of homosexuality at the Portman Clinic (I.S.T.D.) with entirely negative results.

Of the other perceptual projective techniques the most important is the Rorschach. A similar technique, which has the advantage of being applicable to blind people, is a three-dimensional perceptual test developed by Twitchell-Allen (1947).

The Rorschach is certainly a most controversial device and has been under attack lately because of the dearth of experimental evidence for its validity. Some psychologists, for instance Thurstone (1948), deny that Rorschach workers have any recognition or status in psychological science. Others, like Vernon (1935) and Rotter (1948), regard it not as a test but as a clinical tool or a psychodiagnostic instrument.

Among the Rorschach workers themselves there have been on the one hand attempts to establish statistical norms (Beck, Rabin, Thiesen, Molish and Thetford, 1950; Feinberg and Gurvitz, 1954), and on the other hand some abandonment of the sign approach altogether. Klopfer and Kelley in their original text-book of the Rorschach technique (1946) use the sign approach frequently, that is they list various specific signs which are supposed to be pathognomonic of various clinical entities. In his latest volume, however (1956?),* Klopfer admits that "there are hardly any signs whatsoever that prove to be pathognomic. Most signs are so rarely specific for any clinical groups of subjects that a comparison with any control group results in an overlap of the occurrence of these signs in both groups."

With special reference to homosexuality it must be said that there are no known differences between the Rorschach responses of men and women. A recent study with this particular aim in view, by Felzer (1955), fails to elicit any meaningful differences, but this is not surprising as Felzer used only formal Rorschach categories. Some signs have been widely accepted in the literature as suggestive of homosexual inclinations, as for instance the so-called "anal emphasis",† but their discriminating power is uncertain: the Rorschach signs of homosexuality which have been described in the literature and frequently used since the early work of Bergmann (1945) and Due and Wright (1945)‡ have again failed to reach statistical significance in a controlled study by Nitsche, Robinson and Parsons in 1956.

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* This book has no indication of the date of its publication.

† Shafer (1954) found "anal emphasis" just as frequent in obsessional and paranoid pathology, but this finding may be used in argument for, rather than against, the Rorschach, as obsessional and paranoid patients are regarded by the psychoanalysts as latent homosexuals. These patients also manifest many "anal" character traits.

‡ These signs include artistic references, high percentage of sexual and anatomical responses, homosexual postures, heterosexual revulsion, uncertainty in the identification of men and women, seeing people of different sexes on two symmetrical sides of the blot, confusion of sexual identification, derealization castration and phallic symbolism. Other signs of homosexuality include references to people looking around (Shneidman, 1951), seeing things as whirling, seeing lipstick marks or lips, confusion about identity of sexual organs (Shafer, 1948), references to clothes (Phillips and Smith, 1953), and many other content categories.

Wheeler (1949) used the signs suggested by Bergmann, Due and Wright, and Lindner (1946) in his own scheme of twenty signs. This scheme was recently subjected to experimental validation in a study by Davids, Joelson and McArthur (1956). Three matched groups (one homosexual, one neurotic non-homosexual, one normal) of twenty subjects each were tested. All scoring was blind. Wheeler's scheme of twenty signs was, as a whole, able to differentiate significantly between the homosexual subjects and both control groups, but the overlap between the groups was large. Taken individually only four signs discriminated significantly at the 5 per cent. level.

Among the accepted text-books Rapaport (1946), Shafer (1948, 1954), and Phillips and Smith (1953) quote responses indicative of homosexuality; Beck (1949), Klopfer and Kelley (1946), Klopfer, Ainsworth, Klopfer and Holt (1954), and Klopfer *et al.* (1956?) do not mention any such signs. In fact Beck in his second volume (1949) describes in detail a case of homosexuality without mentioning any evidence in the whole Rorschach protocol for this particular patient being homosexual.

If one compares the current clinical practice, as reflected in these text-books, with published research data, the disparity is striking and the need for properly controlled studies apparent. No such studies are likely to make the Rorschach an accurate instrument for measuring homosexuality; but its value as a clinical tool would be increased by gains in objectivity of scoring and interpretation.

TESTS OF INTERPERSONAL RELATIONSHIPS

This group of tests includes play techniques, sentence-completion and drawing-completion tests; but the most important are probably the thematic tests, all essentially following the basic assumptions underlying the Thematic Apperception Test developed by Henry Murray and Christiana Morgan (Morgan and Murray, 1935, 1938; Murray, 1943). There have been many studies aiming at establishing the reliability and validity of the T.A.T. (Combs, 1946a, 1946b, 1947; Grygier, 1954; Harrison, 1940; Henry, 1947; Murray, 1937, 1943; Newcomb, 1947; Rotter, 1940; Tomkins, 1942, 1947; White, 1937a, 1937b), and although the results have not always been positive, the test seems to be a highly satisfying instrument in the hands of an experienced clinician. There have been several attempts to develop a uniform scoring system and norms (Bellak, Ekstein and Braverman, 1947; Rosenzweig, 1949; Rosenzweig and Fleming, 1949; Shorr, 1948; Sisk, 1947; Wittenborn, 1949) but these norms are seldom, if ever, used in clinical practice and one is led to the conclusion, most clearly stated by Wyatt (1948), that the more we break up the original data of a test into variables which can be quantified the more we remove them from immediate experience, and the original quality of the subject's fantasy is lost.

Other tests, like the Children's Apperception Test (Bellak, 1949), the Picture Story Test (Symonds, 1948), the Make a Picture Story Test (Shneidman, 1948, 1952) and the latest Object Relations Technique (Phillipson, 1955), pose very similar problems in measurement and interpretation.

With regard to homosexuality there have been attempts to establish, as for the Rorschach, specific signs by which sexual inversion can be detected. Misidentification of the sex of the figures and confusion of sexual roles, evidence of homosexual attraction and concern with relationships between people of the same sex, strong identifications with figures of the opposite sex or with figures of the same sex having characteristics of the opposite sex have all been listed as suggesting homosexual trends. Only recently have these signs been subjected to experimental validation (Davids, Joelson and McArthur, 1956) with encouraging but not altogether satisfactory results. Taken individually only two out of ten T.A.T. signs differentiated significantly between the homosexual and the control groups; and although the total scheme of ten signs did bring out statistically significant differences in accordance with theoretical expectations, the overlap between the groups was very large.

In conclusion, the ability of the existing tests of interpersonal relationships to give any clinically meaningful quantitative data for individual use appears to be very limited; but when, instead of measuring, we use these tests as a help in understanding the dynamic inter-relationships between family patterns, identifications, needs, traumas, and complexes and the origins of homosexual behaviour, they can give a wealth of material.

Tests Measuring Personality in Developmental Terms

There are several such tests, some using pictorial material, such as the Blacky Pictures (Blum, 1949, 1950), others using written material of the inventory type, such as the Personal Preference Scale developed by Krout and Krout (1951, 1954). I have used a new test of this type, the Dynamic Personality Inventory (Grygier, T. G., 1955a, 1955b; Grygier, P., 1956) in a pilot study of homosexuality,* and the results suggest that it might be possible not only to differentiate between homosexuals and well-adjusted individuals, but also to distinguish between different types of homosexuals.

The Dynamic Personality Inventory (D.P.I.) follows in its construction the general framework of the psychoanalytic approach to the study of personality and the theoretical principles of measurement elaborated by Krout and Krout Tabin. It consists of a list of over 300 items; the subject marks his reaction to these items in terms of like or dislike. The items are presented in random order, and are subsequently divided, by means of special punched-hole card keys, into over thirty scales which give measures of personality in developmental terms, in particular of various tendencies, sublimations, reaction-formations and defence mechanisms associated with the various stages of psychosexual development, with masculine and feminine identifications, and with three aspects of ego-strength. All scoring is purely mechanical and objective.

The test has been extensively validated and over fifteen thousand correlations of the various scales of the test with external criteria have been calculated. The work on item analysis, which aimed at making the scales of the test internally consistent, has resulted in split-half reliability coefficients several times higher than the highest inter-correlations between the scales; it can therefore be assumed that each scale measures some specific aspect of personality which is not measured by any other scale.

In the process of standardization and item analysis it was found that women score higher than men on the scales measuring passivity, need for comfort, warmth and support, emotional dependence on others and sexual repression; they score much higher on narcissism, interest in children, and the tendency to adopt feminine social roles. Men score higher on various scales measuring aggression (oral aggression, verbally expressed aggression, and punitive and anal sadistic traits), on drive and on unconventional attitudes, and they show more interest in group activities; they score much higher on masculine identifications and on some aspects of ego-strength, in particular initiative, self-reliance and leadership qualities.

With respect to homosexuality my pilot study involving a group of 30 neurotic male homosexuals and 203 male subjects with no known history of neurosis or sexual maladjustment revealed some meaningful differences. The homosexuals did not differ from normal men in exactly the same way as women differ from men. They were, for instance, no more emotionally dependent, and they were certainly no more conventional. Their ego-strength was much below the average for the normal male subjects, but it must be remembered that all these homosexuals were psychiatric casualties, and neurotic patients generally tend to have lower ego-strength than well-adjusted subjects. The most important differences were in terms of narcissism and of masculine and feminine identifications. As predicted on theoretical grounds,* the homosexual group scored significantly higher ($t=2\cdot407$, $P<\cdot01$) on narcissism than the control group, and their scores on the difference between masculine and feminine identifications were strikingly different. The normal group scored on masculinity 5·74 points *higher* than on femininity; the homosexual group scored 1·90 points *lower* on masculinity than on femininity. The critical ratio of the difference between the two means was 7·835 which is highly significant ($P<\cdot001$).

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* A more comprehensive report of this research is intended for a separate publication.

More interesting than the differences between the homosexual and control group are differences within the homosexual group itself. Out of 30 homosexuals 13, that is nearly 50 per cent., showed a definite reversal of sexual identification, that is they scored in the way which is usual for women; only two normal subjects (1 per cent. of the control group) scored this way. Seven out of these thirteen patients also scored well above average on narcissism.

Eight homosexuals, that is 27 per cent. of the group, had about equal scores on masculinity and femininity and also scored above average on narcissism; only 8 per cent. of the control group scored this way.

The remaining 9 subjects scored in a way that was not unusual in the normal group: 6 scored high on narcissism; two scored equally high on masculinity and femininity; and one subject scored low on masculine identifications and even lower on feminine ones.

With regard to female homosexuality my data are inadequate. It is true that all female homosexuals I have tested scored higher on masculinity than on femininity, but it is also true that many well-adjusted women scored the same way.† My data suggest that in women masculinity of interests is significantly correlated with intelligence and professional status, while the correlations for my group of normal men were ·11 between masculinity and intelligence and ·05 between masculinity and education. Narcissism correlated around zero with intelligence in both sexes.

CONCLUSIONS

(1) It appears that no exact measures of the direction of sexual attraction are available at present. Some indications of homosexual attraction or heterosexual revulsion may be obtained by means of projective tests, especially the Draw-a-Person Test, the Rorschach and the thematic tests, but the validity of the indicators is very uncertain.

(2) With regard to the peculiarities of the homosexual's attitudes, behaviour and personality traits more precise data are available. It must be remembered, however, that the homosexual is not simply a man behaving like a woman, and for this reason tests of masculinity and femininity are not always very enlightening in the understanding of homosexual behaviour. As Terman and Miles (1936b) say, a "most emphatic warning is necessary against the assumption

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* See, in particular, Glover (1949) who differentiates between homosexuals with feminine patterns of identification (with the mother imago) and the predominantly narcissistic type to whom the love-object is essentially a substitute for the self. *Cf.* also Scheidlinger (1952).

† *Cf.* Terman and Miles (1936b), and a recent study of adolescent gang behaviour by Galvin (1956).

that an extremely feminine score for males or an extremely masculine score for females can serve as an adequate basis for the diagnosis of homosexuality, either overt or latent". This is particularly true of high masculinity scores in women.

(3) The concepts of masculinity and femininity are not always clearly understood. Psychological masculinity is a more complex concept than the difference between the male and the female sexes. The usual technique in measuring masculinity and femininity is a questionnaire, but more comprehensive tests, such as the Terman-Miles, or those measuring personality in developmental terms may be more promising.

(4) All the projective and developmental tests lay claim to their ability to detect the dynamic aspects of homosexuality and therefore to help in the understanding of the origin of sexual inversion in individual cases and possibly in more general terms. In our present state of knowledge it is difficult to validate these claims, as understanding extends beyond measurement, and therefore beyond the usual sphere of experimentation and validation. Precision of measurement is an important asset in this field, but the clinical psychologist must be more than a mere psychometrician.

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THE SEXUAL BEHAVIOUR OF YOUNG CRIMINALS

By

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One of the ways in which the psychiatrist differs from others who work with delinquents is in the importance attached to the sexual history of the offender. The contribution of psychiatrists in this respect has been mainly confined to a description of the emotional and dynamic aspects of sexual adjustment. But it is reasonable to suppose that if these emotional differences are as important as they seem to be from a study of individual cases, they would be reflected in differences in objective sexual behaviour, which are sufficiently definite to be used by criminologists in their more systematic studies. In the case of emotional relationships within the family, for example, psychiatric emphasis has induced criminologists to consider "broken homes" or "maternal separation" in a systematic way, but very few attempts have been made to relate the objective aspects of sexual behaviour and development with criminal behaviour. Even in the Gluecks' exhaustive study of five hundred delinquents and controls, which included psychiatric examination, sexual behaviour was not recorded, but only the presence or absence of sexual conflicts.

The present object therefore is to consider the sexual behaviour of young criminals, and to relate it systematically to their criminal behaviour. For the present, the main object must be to establish the facts: it would be premature to try to interpret them in any detail.

The data upon which this paper is based are obtained from a representative sample of two hundred Borstal lads (aged sixteen to twenty-one). During 1953 and 1955 every other lad sentenced to Borstal training in the Greater London area was psychiatrically examined and given additional psychological tests; and a home visit was made wherever there was a home in London, in addition to the visits made by the authorities. The population is therefore entirely representative of London Borstal lads who normally make up about a third of the Borstal population, though not necessarily representative of young adult offenders generally. Later there was an opportunity to obtain further information when nearly all the first hundred lads, seen in 1953, were interviewed and re-tested in their respective institutions during 1954, and in all cases their progress was discussed with their housemasters. The second hundred has not yet been visited.

The sex histories were obtained during a routine psychiatric interview of one and a half to two hours. It was always the last aspect of the history to be dealt with, when as satisfactory a relationship as possible had been obtained. The lads were told that the author was a doctor "from outside" and where necessary were reassured that the examination was confidential.

It was easier to obtain information than was expected. The lads seemed to find nothing surprising in discussing such questions with a doctor. As Logan (1953) found in his study of eighteen-year-old lads from a London suburb, youths of this age have usually got over the tongue-tied embarrassment of early adolescence and are faced with consciously grasped problems which they are quite willing, and sometimes anxious, to discuss in a confidential interview. There is no reason to suppose that such a sex history is any more or less reliably obtained than that of any other matter which is charged with emotion. Psychiatrists are well aware that expressed attitudes to parents or even reasons for leaving jobs cannot always be taken at their face value: information about sex behaviour is no more, but also not less, reliable. A further reason for confidence was that the results in the second hundred cases agreed very closely with those in the first.

There were probably two general tendencies to error. There was much less admission to homosexual interest or experience than expected, and it was later proved that such details had been suppressed in some cases. On arrival in an all-male institution it is to be expected that lads will brace themselves more than ever against unconscious or scarcely conscious feelings of this sort, and those who were consciously aware of such tendencies may have feared that such a confession would influence their allocation to an open institution. Secondly, it was expected that lads of this age would wish to boast of their heterosexual adventures. They did this much less than expected: and such positive errors are fairly easily uncovered if the history is taken slowly and in detail, approaching the same topic several times in different contexts so that admissions follow painlessly.

There are great difficulties in finding any control group of lads between sixteen and twenty-one who are not heavily selected by membership of some youth organization or in some other way. The best available control group is that studied by Logan (1953) who was able to examine seventy-four out of eighty-five youths of eighteen who registered for National Service on a certain date in a London borough. Some tentative comparison with this group is possible.

A comparison can also be made with Kinsey's (1944) results. It is sometimes supposed that his incidence figures would not be true of Britain; whether this is true or not, it seems likely that his remarks upon sexual development and the relation of one sort of activity with another would remain true outside the United States.

Any attempt to relate the delinquency of these lads in any detailed way with sexual adjustment would clearly involve detailed and lengthy case studies. In this age group there are, of course, many cases in which the delinquency is closely related to sexual maladjustment, although only two were sent to Borstal for sex offences, and only eight had recorded sex offences at any time. The object here is only to consider the more objective aspects of sex behaviour and relate these, if possible, with the criminal and social history.

MASTURBATION

Details about the onset of puberty were often not obtained or were unobtainable. The best indication of the onset of sex experience was provided by the history of masturbation. The ages at which masturbation began are given on the opposite page.

At least 65 per cent. therefore give a history of normal onset of masturbation: in at least 19 per cent. it can be regarded as definitely delayed to sixteen or later.

On the whole the lads seldom remembered being given lectures upon the evils of masturbation or its threat to health, of a sort which were said to be common a generation ago. About 13 per cent. of those who admitted masturbation showed a good deal of guilt and spoke of injury to health. The frequency

Age	First Hundred	Second Hundred
11	?	2
12	?	1
13	?	4
14	40	43
15	17	22
16	12	13
17	5	5
18	1	2
Nil	8	8
Uncertain	17	0
Total	100	100

of masturbation was not always obtained in detail but was usually once or twice, or two or three times a week. Not many, however, were willing to admit continuing the practice until aged seventeen or eighteen, even when it was not replaced by anything but the most sporadic heterosexual behaviour. The usual history was of having given it up after two or three years. This may be the normal process, since Kinsey makes it clear that the highest incidence is between adolescence and fifteen and that the rate normally falls off after that, though to a much lesser extent than here. He also stresses that masturbation is not regarded as so excusable or normal by boys of this educational level as it is by those who go to grammar schools or college. There is certainly plenty of indication that these lads are subject to much social pressure to adopt a more vigorous heterosexual life than their better educated contemporaries. The sense of inferiority and failure may increase as they grow towards the late 'teens.

The best indication of guilt is provided by the 8 per cent. who denied all masturbation. This is usually taken as a pathological phenomenon and, in fact, only one of the sixteen—who were mainly seventeen or eighteen years old—showed such psycho-physical immaturity that this probably explained the absence. The remainder were normally developed and were probably cases of suppression rather than lack of readiness.

Those who were immature were, on the one hand, well represented among those in whom masturbation was delayed until sixteen or seventeen. Many of the intellectually dullest and most immature lads were among the late starters, though there were a number of cases of sexual conflict. One-third of the cases later showing homosexual behaviour were in the nil or retarded groups. Those who were retarded included a number of lads brought up in Ireland, where they said it was expressly forbidden, and they were regularly questioned about it: three of them had broken out into vigorous heterosexual intercourse, one of them after an indecent assault on a child, before permitting themselves to masturbate.

Logan found that no less than 26 per cent. of his eighteen-year-old London lads might "be considered 'children' as no history was obtained of any emissions", though he was doubtful if this represented delayed development or denial to the doctor; 55 per cent. were "adolescent"—masturbating frequently and without heterosexual emissions. Considering only their behaviour at or before the age of eighteen, 92 per cent. of the Borstal lads questioned had at least experienced masturbation at some time—an identical figure with Kinsey's. Although the Borstal population strikes newcomers as containing a surprising number of very immature lads, they do not appear to be immature sexually.

The possible criminological significance of such delay or suppression was examined by comparing the fifty-four nil or retarded cases with the one hundred and twenty-nine "normal" cases with regard to ninety-four categories of history, crime or family status of a sort familiar in criminological analysis. Features which were positively associated with late onset of masturbation and statistically significant were:

	Nil or Retarded =54	"Normal" =129	
I.Q. "E" (bottom 10 per cent.)	16	14	P ·01
First offence after sixteen	25	35	P ·02
Educational backwardness	28	43	P ·05
Marked poverty	17	20	P ·05
The following, however, were associated with normal and early onset of masturbation:			
First offence at 12 or less	8	47	P ·01
In approved school	11	47	P ·05
Any violent offence	2	22	N.S.

Apart from low intelligence, and educational backwardness and poverty which are probably associated with it, there is a clear indication that an early onset of delinquency is associated with early or normal onset of masturbation (and, by implication, of puberty), although the delinquency precedes it; those late in starting delinquent behaviour tend to be late in starting masturbation. It may be added that it is only in masturbation, which is nearest to being a biological index, that a relationship with onsetting crime is found. The onset of heterosexual and homosexual behaviour was not significantly associated with any type of criminal onset.

HETEROSEXUAL BEHAVIOUR

The experience of heterosexual coitus, or lack of it, is shown in the following table:

	Age							Total
	14	15	16	17	18	19	20	
Occasional coitus from age	4	13	21	23	9	3	0	73
Promiscuous coitus from age	5	14	9	4	2	0	0	34
No coitus	0	0	11	36	23	16	7	93
								200

The age of the sample was as follows:

	Age					Total
	16	17	18	19	20	Total
Age of sample	19	59	51	44	27	200

Seven gave a history of attempted coitus before fourteen. Actual heterosexual intercourse had occurred at twelve in only one case, a precocious and active youth who later became a homosexual prostitute: others thought they had succeeded in having "a good try".

Seven were married, nearly all as result of pregnancies, and seven others had been responsible for illegitimate children. Only eleven lads had experience with prostitutes, almost all while in the Merchant service. Only three had had venereal disease.

It will be seen that there is a wide range of behaviour. It was thought best to divide those having occasional intercourse from those who were "promiscuous" since a different type of behaviour is involved. The first type showed a normal interest in the society of girls and boys, later moving in natural stages to "steady" girl friends lasting a month or two, and later still to even steadier friends. They had sexual intercourse with some of these girls occasionally, but the relationship was far from dependent on this. The "promiscuous" group only appeared interested in obtaining sexual intercourse; their acquaintances were casual and never persisted, whether or not sexual intercourse took place. Usually, of course, it did: as one lad said, "I always look for sexual intercourse in a girl".

It was a surprise to find that heterosexual behaviour, including coitus, began so early in a substantial proportion. It has always been recognized that experimentation is common in childhood, but not so commonly realized that coitus frequently begins and continues immediately after the onset of puberty. In both the occasional and the promiscuous groups it is common to obtain a story that the lad has had sexual intercourse with several girls soon after leaving school "like everyone else", sometimes with much older girls, but usually with girls of the same age or a little older. It is rare in these delinquents for this to continue. Among the "occasionals" it becomes much more sporadic and among the promiscuous there may be a rapid falling off of all sexual contacts, since they are often incapable of socialized sexual relationships. Among the promiscuous, there were only twelve who went on to steady promiscuous behaviour and fewer still who were really active once to three times a week. Many stressed that they had soon given it up and were now "not interested". Even among the inexperienced the onset of masturbation was accompanied by social contacts with girl friends and then both activities tended to fall off, though a small proportion of these lads were better educated and went on to increasingly developed relationships with girls, coitus being restrained by cultural factors.

This early development might have been doubted were it not for the fact that so few of the nineteen or twenty-year-olds claimed to be starting this behaviour; those who were promiscuous had started much earlier. There are important changes at nineteen and twenty, but these are chiefly sociosexual. A promiscuous lad may develop a steady relationship with a girl who refuses intercourse and wants to marry him, while continuing promiscuous behaviour with other girls. The "occasional" has intercourse with a fiancée instead of a girl friend. Much more rarely a previously inexperienced lad starts intercourse with a fiancée. The potential pattern of sexual behaviour appears to be laid down rapidly after puberty: the wide psychological and social developments are grafted on to it later.

This view is supported by Kinsey (1944). He has done a great service in disproving the common assumption that sexual activity rises to a peak in the twenties and in pointing out that the maximum activity, in whatever form it takes, follows immediately upon adolescence. Once established, it tends to continue. In those in whom adolescence is delayed, there is also a delay between adolescence and the development of sexual activity, whether masturbation or coitus. In girls he found a much greater delay before the onset of sexual activity of any form. Experience in a remand home for adolescent delinquent girls confirms this. Although the vast majority of such girls are sexually experienced, this behaviour usually has begun at fifteen or sixteen; rather than twelve to thirteen as it should if it followed immediately upon puberty.

It seems probable that a smaller proportion of adolescent girls of fifteen or sixteen must be taking part in the early promiscuity of 25–30 per cent. of the boys. The peak age of seventeen in the onset of coitus in the boys may be due to the receptivity of the girls of this age or a little later: nowadays the removal of the eighteen-year-old boys for National Service must enhance the opportunities of the seventeen-year-olds.

The social behaviour of the delinquents was as follows:

"Don't trouble with girls"	72
Occasional girl friends and "steadies"	60
Promiscuous	34
Well-developed relationships	27
Married	7
	200

Nearly all the developed relationships were important but stormy relationships of young adult type and were the concern of lads of nineteen or twenty.

It is difficult to compare their behaviour with Logan's normal English population owing to uncertainty about terminology. In his survey, 19 per cent. of the lads were having "heterosexual emissions with or without coitus", as compared with about 50 per cent. of the Borstal lads. When the delinquents' behaviour was reduced to that occurring at eighteen or less, it did not appear very different from that of Logan's group, in spite of the fact that many Borstal lads were less than eighteen. There seemed to be two differences. First, that among the delinquents there were far fewer lads who were delayed or inhibited in all sexual expression, and, secondly, that the delinquents after an early and active start later give up a good deal of their physical or sociosexual activity, so that the non-delinquents catch them up. This appears to be the opposite of the growth behaviour of delinquents. The Gluecks (1950) have shown that as a whole delinquents tend to have a somewhat delayed adolescent growth spurt and tend to catch up non-delinquent controls in their late 'teens.

The main general characteristic of the heterosexual behaviour of the delinquent seems to be this tendency to "lose interest"—a constantly recurring phrase. These late adolescents tend to have a history of early promiscuity or mixed friendships; little by little their friends drift away with steady girl-friends and the gang becomes increasingly composed of somewhat desperate youths who have no physical or social sexual contacts or who only leave the gang for the most fleeting encounters. The less active lads too soon give up their early tentative friendships with girls and drift into delinquency with one or two male companions.

There are, of course, many cultural influences. Although nearly all the lads come from the same social and education class, they come from very different areas of London. The promiscuous lads tended to come from the overcrowded and highly delinquent areas.

An attempt was made to examine the criminological significance of heterosexual experience by considering the ninety-three inexperienced and one hundred and seven experienced lads in relation to the ninety-four factors referred to previously. The most significant differences were as follows:

	Inexperienced =93	Experienced =107	
In non-delinquent institutions	27	14	$P<\cdot01$
Intelligence "E" (bottom 10 per cent.)	20	10	$P<\cdot05$
Mother dead	13	5	$P<\cdot05$
Verbal I.Q. higher than performance	22	13	$P<\cdot05$
The experienced had the following characteristics, in order of significance or near significance:			
Father unstable	12	29	$P<\cdot05$
Violent offence at any time	7	20	$P<\cdot05$
Sex offence at any time	1	7	N.S.
Mother physically ill	6	16	N.S.
Performance intelligence higher than verbal	40	58	N.S.
Marked truancy	32	46	N.S.

The most significant association with inexperience is a history of having been at some time in an institution for non-delinquents, usually a children's home in the care of the local authority. The finding that the mother is more frequently dead is also no doubt related to this. Those who have been in approved schools, on the other hand, are not distinguished by being experienced or otherwise. The histories suggest that boys often have experience, or at least establish the direction of their interest, before they are committed to approved schools; but those in children's homes, especially if they stay throughout puberty, are far less aroused and are less often in contact with experienced contemporaries. It is often overlooked that on release at sixteen these boys may have many sociosexual problems to face in addition to those of getting a job and managing their lives.

No difference was found in the proportion of broken homes in the two groups, but the type of break appeared to differ, though not to the level of statistical significance.

	Inexperienced =93	Experienced =107	
Home broken at 2 or less	10	18	N.S.
Home broken at 5 or less	20	6	$P<\cdot01$
Home broken at 10 or less	11	11	N.S.
Home broken at 14 or less	6	6	N.S.
Home broken after 14	—	4	N.S.

A home broken at birth or soon after may often be the least traumatic type, since adequate substitutes are more often found; later on the effects of parental discord or rejection are often more marked. Of the eighteen experienced lads who lost a parent soon after birth, eleven received fairly satisfactory and permanent homes with their grandparents or mother.

The increased frequency in the experienced of unstable fathers, ill mothers, and perhaps of truancy and educational backwardness, suggests intact but unsatisfactory homes. Such a background, with perhaps greater emotional warmth, laxer discipline, and contact with the cruder standards of a delinquent area, may be in complete contrast with institutional life, with its lessened satisfactions, higher moral standards, greater discipline and lessened opportunity. But it may be that a life of emotional deprivation actually retards development or at least that those who succumb to its effect are those who do not have the vigour to obtain the compensatory sexual relationships which must ultimately mean so much to the adult who has had a deprived childhood.

The experienced are also distinguished by including most of those who have at any time been convicted of a violent offence. A later table also shows that violent offenders were mainly among those judged to have a strong sex drive. This latter relationship would perhaps be expected on clinical grounds rather than the former, for the aggressive offender seems often to be inhibited in sexual expression. Those who committed sex offences were also mainly experienced, though often not before committing the offence: in adolescence a heterosexual offence is usually followed by coitus within the next year or two.

It was not expected that differences in verbal and performance intelligence would turn out to be significant in relation to both normal masturbation, heterosexual experience and, as will be seen, homosexual trends. This is probably due to a complicated set of circumstances. The experienced, and those who start masturbation early or at a normal age, are mainly those living at home, under poor control, playing truant and joining in the activities of a delinquent area: they tend to do badly in tests involving verbal items. Boys in institutions may on the other hand be better educated. The onset of sexual interest has its effect upon schooling. Kovacevic (1956) has found among school boys that those who are heterosexually active tend to fall off in their rate of progress at school, while the inactive progress as expected: the active boys, however, tend to make good this lag and even tend to overhaul the inactive but more single-minded scholars. There may, however, be a more fundamental maturational difference. Delinquents (Hodge, 1953) tend to have a higher rate of abnormal electroencephalogram than those who do not have behaviour problems. Rey (1956) has shown that paroxysmal abnormalities of the EEG are associated with performance intelligence which is much higher than verbal; whereas in non-paroxysmal abnormalities the verbal intelligence is significantly higher than performance. Truancy and delinquency may be the result as much as the cause of these intellectual differences.

Sex Drive

The data were further analysed by contrasting those lads with apparently strong and weak sexual drive, irrespective of its method or direction of expression. Clearly, a strong sex drive may be associated with no more than frequent masturbation or nocturnal emissions, and a lad with rather little drive may still appear as experienced as a result of some chance encounter. Clinically it is recognized that some with a strong drive may show much temporary inhibition, and that a few are neurotically active without having a strong drive; the fact that one recognizes such groups implies that one relies to some extent upon the history and general pattern of behaviour to assess the basic strength of the impulse.

When those with a sex drive judged to be above or below average were considered in relation to the various criminological factors, the significant differences were as follows:

	Drive Above Average=115	Drive Below Average=85	
Intelligence "E" (bottom 10 per cent.)	9	21	P<·01
Enuresis after 8	16	25	P<·02
Father physically ill	8	17	P<·02
Living with both parents	30	35	P<·05
Parents separated after 5	28	10	P<·05
Present offence larceny	31	35	P<·05
Violent offence at any time	21	6	P<·05

It was interesting to find that it was only in this relationship that enuresis, which is always found more commonly in delinquents than controls (Glueck, 1950), showed a significant difference. Those whose drive is below average tend to be still living at home.

The difference in the incidence of larceny is part of a pattern which ran through all the tables but was usually below the level of significance. "Breaking offences" (shopbreaking, housebreaking, etc.) are characteristic clinically of adventurous, extravert and psychiatrically normal lads at this age, and such lads are often sexually active and experienced. Larceny, on the other hand, especially larceny from home, robbing one's own gasmeter, etc., is often the act of a very disturbed or, sometimes, psychiatrically abnormal youth. But it is only in this table that such differences are significant.

One interesting relationship emerged only with reference to the second group of a hundred boys (where the more detailed information permitted a more accurate classification). With them there was a significant tendency for "low-drive" cases to be convicted first before twelve and "high-drive" cases to be convicted after fifteen.

	High Drive =57	Low Drive =43	
First conviction at or before 12	14	20	$P<\cdot05$
After 15	32	14	$P<\cdot05$

This presents the paradox that those who masturbate early or normally commit offences early, and so do those with a sexual drive below average. It is tempting to suppose that this provides confirmation of the clinical impression that in adolescence some crime is a substitute for sexual activity, puberty being early or normal but followed by what appears to be a loss of drive or interest. The crime which most often has this sex-substitute quality is "taking and driving a car without consent".

Homosexual Behaviour

Perhaps the most important point that has to be made about homosexuality is that it should not be considered in isolation from heterosexuality. The issues are those of sexuality, with homosexual and heterosexual components in each case.

It has already been mentioned that some of these lads were thought to have suppressed their homosexual experiences. Seventeen of the two hundred remembered having witnessed mutual masturbation and other homosexual incidents in various institutions and in the armed forces. Five admitted taking part, but most would only admit to being pressed to take part.

A surprising number spoke of homosexual approaches being made to them in the general community. With the first hundred cases no special enquiry was made and only seven spoke of actual homosexual assaults or serious attempts. With the second hundred, however, it became clear that this was much commoner than supposed and the majority were asked if any stranger or adult had ever "tried to make a pass at them" or interfere with them. No less than 34 per cent. of the second hundred gave at least one instance of this sort. In most cases the approach was by a strange man in a cinema, less often money was offered in some quiet place. Eight of this hundred had been subjected to an actual assault, either voluntarily or by force. But it was interesting to find that the 34 per cent. usually looked upon the incident as quite trivial and not worth mentioning when dealing with any homosexual behaviour with contemporaries. Usually it had no ill-effect—the history was given by 33 per cent. of lads who had no homosexual trends and 32 per cent. of those judged to have homosexual problems or tendencies. But five of the eight actual seductions involved boys who were considered homosexual suspects. In most cases, homosexual practices had taken place before the seduction, which mainly taught the lad that he could make money out of it.

The incidence of homosexual tendencies is best dealt with separately in the two hundreds since the second hundred have only been examined on conviction and their behaviour in Borstal has not yet been studied.

In the first hundred, at the time of sentence, three were homosexual prostitutes who described their homosexual tendencies quite freely in confidence. Two were charged with larceny and one with robbery. All three had extensive heterosexual experience and one who specialized in sado-masochistic behaviour preferred heterosexual behaviour, though he had little time or energy left for it. A fourth exclusively homosexual prostitute was withdrawn from the series after his sentence had been altered to imprisonment on appeal.

In addition, there were thirteen others—a total of 16 per cent.—who were diagnosed as having important homosexual problems. None of them admitted any inclinations of the sort. This did not mean that the lads were "homosexuals" who were keeping quiet about their conscious tendencies, but that there was evidence of conflict which might lead to complications during Borstal training. Such tendencies varied very much in degree from those who had neurotic symptoms to those who were undifferentiated in their sexual outlook and might be influenced in either direction in the future.

The question could be studied more thoroughly when they were interviewed in the institutions a year later, and their progress discussed with their housemasters.

Of these sixteen, only three showed overt homosexual behaviour which had needed disciplinary action. Two of the prostitutes had been no trouble from the homosexual standpoint, although one had been punished for cat-calling after passing girls: the third had had to be warned for repeated attempts. One of the suspects was given a prison sentence for a severe offence, and another was involved in minor trouble. After further review, the problem was considered to have been overstressed in two of the original cases, but in the remainder there was no reason to change the original opinion, though there was no evidence of overt homosexuality.

On the other hand, there were thirteen lads, including these three, who had to be dealt with for homosexual behaviour. It was usually a minor offence, but never an isolated one. A total of 15 per cent. therefore either showed homosexual behaviour or had declared inclinations.

These fifteen lads fell into four groups. There were, first, the three prostitutes whose inclinations were declared and could therefore be managed with a full realization of the situation. Secondly, there were two neurotic older lads, one correctly diagnosed, who had quite strong concealed tendencies. The second was a severely disturbed youth who had many sexual problems, but the homosexual tendency was overlooked, partly because he had made a fairly successful marriage. Both had previous homosexual experience which they had not mentioned at the time of sentence.

Thirdly, there was a group of five rather aggressive and unco-operative lads, usually with a history of serious delinquency and gang associations. Nearly all had had heterosexual experience, often with early promiscuity which later died out, and their overt interests were mainly heterosexual. It is usual to speak of this type of lad merely as highly-sexed and unscrupulous and tending to substitute homosexuality if heterosexual behaviour is not possible; but this view certainly underrates their real difficulties in achieving the heterosexual adjustment which they aim at.

Fourthly, there were five young and immature lads who came from the group of 35 per cent. of lads who had little or no heterosexual experience, and had little interest in girls. Many of these have an undifferentiated attitude, and homosexual behaviour at this age is of the common schoolboy type which is difficult to predict. On review they do not differ much from the rest of the immature group, but they sometimes show that they are not merely shy by expressing fear of and hostility towards girls, saying that girls always want to boss, or are all gold-diggers, or by having an unexplained conviction that they will never marry.

The incidence in the second hundred was similar. There was one exclusively homosexual lad who had recently taken to prostitution, four with clear homosexual as well as heterosexual interests and twenty "suspects", ten of them with important problems, and ten of the undifferentiated type.

Among the two hundred cases there were thus fifty lads with some homosexual potential and one hundred and fifty in whom this was negligible. When these fifty were compared criminologically with the one hundred and fifty, they had the following characteristics:

	"Suspects" = 50	Remainder = 150	
History of psychiatric treatment	13	10	$P < \cdot 01$
History of neurotic symptoms	20	31	$P < \cdot 05$
Verbal higher than Performance intelligence ..	14	21	$P < \cdot 05$
Disturbed relation to siblings	15	28	N.S.
The "Suspects" did not have the following characteristics:			
Had major physical disability	5	39	$P < \cdot 05$
Any violent offence	2	25	N.S.
Truancy	16	62	N.S.

The selection of the "Suspect" group is clearly more subjective than the other divisions; the high proportion of neurotic cases may be partly a comment on the criteria for selection, though psychiatric treatment had rarely been given as a result of overt homosexual inclinations.

The rarity of any major physical disability (such as a shortened leg, recent tuberculosis or a blind eye, etc.) was quite marked in both series of a hundred and was not expected. Certainly in outpatient practice one rarely sees an injured homosexual, though major disabilities are common in other perversions, such as exhibitionism. Perhaps homosexuals are less adventurous or accident prone. It is a matter which deserves further investigation.

Although the proportion which came from broken homes was not significantly different, there was some difference in the type of break.

	Suspect	Remainder
Home broken at or before 2	11	16
Home broken at or before 5	5	18
Home broken at or before 10	6	14
Home broken at or before 14	1	9
Home broken after 14	1	6
	24	63

THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Nearly all the lads who could read sufficiently completed the M.M.P.I. This test consists of five hundred printed statements which have to be sorted into true, false, or "can't say". It has been used extensively in work with delinquents (Hathaway, 1953). The scales into which the results are analysed include a masculine-feminine scale, but it has been conceded that this does not effectively differentiate homosexuals. Burton (1947) found that it did not differentiate homosexual delinquents, and the same was true here. However, the test includes twenty-six questions relating to sexual adjustment and two of these had some value. About a third of those replying unexpectedly to the questions "I am attracted by members of the opposite sex" and "I am very strongly attracted by members of my own sex" were in the "Suspect" group, although the test results were not used in making the classification.

RELATION TO PHYSIQUE

All the lads were asked to agree to anthropometric photography. The technique and apparatus was similar to that described by Tanner (1951), the lad being photographed from front, side and rear, unclothed but with a mask to prevent identification. At the same time ten bodily measurements were made. A disappointingly large number of results were lost by refusal to give consent (always an interesting psychological sign) or by transfer, etc. In the end anthropometric photographs were available for fifty-six lads, and measurements alone for nine more. No conclusion can, therefore, be drawn about the physique of delinquents as a whole. The results obtained, however, agreed with the findings of Glueck and Glueck (1950) for American delinquents that the majority were mesomorphs and that there were few extreme types. Twenty-eight were predominant mesomorphs.

	Total	With Heterosexual Experience	With Homosexual Experience
Pronounced mesomorphs	21	16	1
Predominant mesomorphs	7	5	1
Pronounced endomorphs	5	0	3
Balanced endomorphic mesomorphs	10	2	0
Pronounced ectomorphs	6	5	1
Balanced ectomorphs	7	4	1
Total	56	32	7
Mesopenics	8	3	4

The table shows the sexual behaviour of these lads according to their somatotype (the method of physical classification described by Sheldon (1940)). They are divided into six groups. The pronounced somatotypes are those with a rating of five or more in the component concerned: predominant mesomorphs are in the middle range (e.g. 343): balanced endomorphic mesomorphs (443, 442) and balanced ectomorphs (344) are also in the middle range.

The mesomorphs have a higher rate of heterosexual experience than the endomorphs. The pronounced mesomorphs show this most clearly. The average age of this group was a good deal higher than the others, but this was not in itself the explanation of the difference since their experience had begun long before in all but one case.

The available somatotypes of those who were known to have had homosexual contacts showed great variation. They included a high proportion of endomorphs, who tend to be rare among delinquents. But perhaps a more characteristic feature was mesopenia or lack of muscle, a condition in which the mesomorphic component is less than both endomorphy or ectomorphy, whichever of the two is dominant. These possible differences will clearly need confirmation by further research. It may be significant, however, that mesopenic physiques occur particularly commonly in undergraduates (Parnell, 1954) and that it is this group in America who show the highest incidence of homosexual behaviour (Kinsey, 1944).

The extremes of somatotype found in this little group may also be significant. The only lad with the rating of six in endomorphy was strongly homosexual; one homosexual prostitute was one of the three extreme mesomorphs (361); one homosexual prostitute who refused photography and had to be excluded from the series was undoubtedly an extreme ectomorph (136 or 127). There are almost certainly many different forms of homosexuality. It appears probable that transitory and relatively unimportant homosexuality in immature and "undecided" lads is associated with mesopenia or general lack of muscle and often lack of muscular tone, but that more deep-rooted homosexuality is often associated with extremes of somatotype, in delinquents especially with endomorphy.

Discussion

In conclusion, it might be misleading not to mention some of the training problems which are produced by these differences in sex behaviour.

Anyone who interviews lads on admission to Borstal and again a year later will be struck by the great improvement in the general well-being of the vast majority of the lads. One of the less obvious reasons for this lack of strain may be the removal from the atmosphere of heterosexual competition and self-justification by which many were surrounded in their social life at home. To some extent all institutional training must produce a postponement rather than a solution of such a problem.

On the other hand there is always the possibility that homosexual difficulties will be accentuated. The policy of the Prison Commission in these matters has never been officially stated, but from observation of the course of events in a number of cases, the author's impression is that the problem is handled tactfully and carefully. Clearly, there is an obligation to protect lads from undesirable influence but it is also necessary not to allow a minor problem to hamper progress in methods of training in open institutions.

The problems differ according to the type of homosexual. Of the four groups referred to previously, the first, the declared homosexual or homosexual prostitute, is in some ways the simplest problem. His tendencies are recognized, observation can be maintained, he can be invited or required to co-operate. He tends to associate with people like himself. A proportion of such lads will probably derive no benefit from training; but some will be helped to mature, and it is thought that a tendency of this sort should not deprive them outright of the chance of constructive training.

The second group, the neurotic homosexuals, are the most difficult. Their problem, partly kept to themselves, partly repressed, will only be discovered by psychiatric examination before it suddenly emerges during training. Ideally, psychiatric treatment in a special institution would be the best provision, though a proportion would probably elude diagnosis at the time of allocation.

There is a tendency to regard these two groups, amounting to 5 per cent. in the present series, as the "real" homosexuals. Certainly they have major and persistent tendencies. The third and fourth groups, however, are unlikely to be correctly diagnosed except in terms of general susceptibility which would apply to twice their number. They form a large group from which the majority of isolated incidents emerge, and they are usually given no more and no less attention than they deserve.

There is a tendency to think of these incidents in terms of seducer and his victim, but this is rarely the case. Usually it is difficult to say who is more to blame. Debts and cash payments enter into it quite often, and the "victim" may be someone whose schemes have miscarried. Nevertheless, those who deplore absconding should bear in mind that it is a valuable safety valve in the prevention of undue hardship.

There remains the possibility that an occasional lad among the immature group may develop fairly permanent tendencies as a result of experiences of this kind. These are the cases who in adult life have had hard words to say about institutional experiences. In this series there was possibly one such case. It is doubtful if much could be done to prevent this by preliminary selection and the remedy must lie in removal for treatment, or further action during after-care. Many of these problems will be easier to deal with when the opening of remand centres makes possible a more thorough study of lads before sentence to Borstal training.

SUMMARY

The past and present sexual behaviour of two hundred young criminals of sixteen to twenty-one is described and related to their criminal behaviour and, in some cases, physique. A comparison with non-criminal youths is only tentative but, in general, criminals tend to start sexual behaviour earlier and more vigorously, but later abandon it as their criminal career develops. Among the criminals themselves there is wide variation in sexual behaviour. Significant differences are noted between those who are experienced or inexperienced in masturbation, heterosexual or homosexual relations, and between those with a strong or a weak sex drive. Until the facts are more thoroughly established, interpretation is premature.

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A TECHNIQUE FOR THE OBJECTIVE ASSESSMENT OF THE CHILD'S FAMILY RELATIONSHIPS*

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I. INTRODUCTION

ALTHOUGH a great number of tests available today are concerned with the psychological assessment of the child, there seemed to us to be a special clinical and research need for one that would indicate objectively, reliably, and rapidly the direction and intensity of the child's feelings towards the various members of his family, and, of no less importance, his estimate of their reciprocal regard for him.

In child guidance clinics, an objective assessment is made of the young patient's cognitive abilities, and, in certain cases, efforts are made to evaluate the nature of his "projected" emotions. With regard to family feeling, however, clinicians on the whole appear curiously satisfied with simple, subjective "hunches", based often on scanty information from unreliable sources. This is all the more surprising since modern psychiatry attempts to see the child's symptoms in all the complexity of their familial ramifications, and to trace their development to the emotional relationships of the child within his family. An understanding of symptoms and of the choice of symptoms, therefore, might well begin with a careful analysis of family feelings as they are experienced and understood by the child.

Having this in mind, we made the attempt to construct a simple objective device for the exploration of the child's emotional relations with his family. We felt that such a device would furnish useful material for various clinical purposes, for instance, for the initial clinical conference or for the assessment of therapeutic results. At the same time it could also serve as a research tool that would help towards more objective investigations in the field of emotional development.

II. DESCRIPTION OF THE TEST

The Family Relations Test has been designed to dramatize a situation which could be reproduced, it is true, in a paper and pencil form, but with considerable loss in effectiveness. At this period of life, as Piaget has pointed out, the "active manipulation of objects" plays an essential role in the child's "concrete" approach to his universe. Moreover, paper and pencil responses belong more to the atmosphere at school than to the home, and in the emotional sphere it has been repeatedly shown that data elicited by direct methods are of less value than those obtained by indirect, projective, or play techniques. It is our belief, therefore, that any testing of the child should acknowledge this primary predisposition on the intellectual side towards "concreteness", and on the emotional side towards greater spontaneous expression in play. Only methods indulging these propensities will be able to engage and sustain the fleeting interest of the child, and eliminate as far as possible the "tired" and "romancing" responses.

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* The Family Relations Test, devised by the authors, has been accepted for general publication by the National Foundation for Educational Research, and is in the course of manufacture and distribution.

The test material of the Family Relations Test was designed to give a concrete representation of the child's family. It consists of 20 figures representing people of various ages, shapes and sizes, sufficiently stereotyped to stand for members of any child's family, yet ambiguous enough to become, under suggestion, a specific family. They range from grandparents to a perambulated baby, and from these the child is able to create his own significant circle. In addition to the family representatives, another important figure is incorporated in the test. The figure stands for "Nobody" and serves to accommodate those items that are not felt to apply to anyone in the family. Each figure is attached to a box-like base which has a slit at the top. The items are printed on small individual cards. The child is told that the cards contain messages, and that his task is to put each card "into the person" whom the message it conveys fits best. He is not asked to verbalize analytically his many complex feelings for his family, since this would probably lie outside his inclination and ability. He is only expected to make choices between pre-selected emotional attitudes, which are general enough to fit into the frame of reference of any child. The placement of the items is free, including their placement into Nobody. Moreover, the "feeling" thrust into a figure immediately vanishes from sight, leaving no incriminating trace. As there is no visible reminder to the child of his distribution of love and hate, there is less guilt to interfere with his freedom of expression.

The test situation is basically a play situation in which the child decides what feelings fit the various members of his family. The figures representing the members of his family are chosen by himself from the collection at his disposal and from the very beginning it is understood both by the tester and the testee that this is now the child's family, to be treated as such, and this illusion is fostered throughout the situation.

The emotional attitudes explored by the test include feelings of like and dislike, stronger feelings of love and hate (sex and aggression in the widest sense of the words), and attitudes relating to parental overprotection and overindulgence. The items expressing positive and negative attitudes vary in the direction of the feeling they convey, according to whether the feeling comes from the child and goes to some other person, or whether the child feels himself the object of someone else's feelings. The following are examples of the items:

This person in the family is very kind hearted.
This person in the family is very nice to me.
This person in the family is sometimes a bit too fussy.
This person in the family sometimes nags at me.
I like to cuddle this person in the family.
This person in the family likes to tickle me.
Sometimes I hate this person in the family.
This person in the family makes me feel afraid.
This is the person in the family father pays too much attention to.
Mother worries that this person in the family might get ill.

There is also a second version to the test, designed to be used with children of pre-school age. In the case of very young children the feelings of like and love and of dislike and hate easily overflow into each other. For this reason the items for the younger children are not differentiated from one another from the point of view of the intensity of feeling they express. The attitude areas with which this version is concerned include positive and negative feelings, both coming from the child and experienced by the child as coming from others, and feelings of dependency on others.

Examples of the items are:

N.. loves you. Whom does N.. love?
You smile at N.. Who smiles at N..?
N.. thinks you are naughty. Who is naughty?
You get cross with N.. Who gets cross with N..?
N.. likes to come to you when he has hurt himself. Who is it N.. wants when he has hurt himself?

(N.. stands for the name by which the child is usually called.)

The form for the older children contains 86 and the form for the younger children contains 40 items.

The administration of the test is done in the following manner: The child is asked to select a figure to represent each member of his family, including one for himself. After he has set up his family circle the examiner introduces Nobody. He then shows the item cards, and explains that each little card contains a message, and should be put into that person whom the message fits best. If the message does not fit anybody, the card should be put in Nobody. He proceeds with the testing by reading out the cards and handing them to the child one by one. If an item is supposed to fit several people the examiner makes a note of it. Scoring consists of counting how many items of each kind of feeling the child has assigned to each member of the family.

The administration of the test usually takes between 20 and 25 minutes.

III. Interpretation of Test Results

The emotional attitudes expressed by the child's test responses can be thought of in terms of "experienced" feeling emanating from the child, and "imagined" feeling directed towards the child. This differentiation, however, is not at all clearly defined in the child's mind. Neither is there necessarily a high correspondence between the feelings he attributes to the various members of his family, and the feelings the members of his family actually have. For clinical purposes, however, it is his idiosyncratic concept of his emotional environment that has operational value. His "psychic reality" is more likely to be relevant to the aetiology of his symptoms than is the "objective reality" assessed through careful social enquiry.

The distribution of the items by the child has to be examined from the following points of view: Is the distribution lop-sided, with displacement of feeling from parents to other members of the family? Is there an exaggerated positive or negative response to one of the parents? Does the child place many items, either positive or negative, into the figure which represents himself? Does the relationship between the positive and the negative items used by the child point towards ambivalent feelings? Are there discrepancies between the feelings he expresses towards others, and the feelings he believes others have for himself?

The test situation tends to create its own system of "defences" against the expression of guilty feelings, and the results may indicate the following mechanisms; Denial, if the child has placed most positive or negative items into Nobody; idealization, if he has used an exaggerated number of positive items for members of his family while placing most negative items into Nobody; displacement, if he has given more items to peripheral than to central members; and wish-fulfilment, if he has claimed for himself most items expressing protective, indulgent feelings. The test results, in conjunction with case history material, may indicate projection if the child has unrealistically ascribed positive or negative feelings to other people while denying them in himself, and reaction formation if he has substituted opposite responses to the ones really indicated. They may also point to a lack of defensiveness if they show an exaggerated emergence of strong positive or negative feelings.

IV. Some Test Syndromes

The Idealizing Tendency

There is a group of children, variously described as phobic, insecure, timid, passive, inhibited, rigid, compulsive, etc., whose inner fears and destructive tendencies, when projected on to the outside environment, make of it a very frightening place indeed. One of their major mechanisms for dealing with their fears is the primitive one of denial, whereby the danger from without ceases to exist. Three cases of this type of test pattern are presented in Table I.

Table I

Exaggeration of Positive and Denial of Negative Feelings

Diagnosis	Age	Out-going+	Out-going−	In-coming+	In-coming−
1. A.I. (boy): Intense fears of dying and of parents dying; fears of school, food, toilet, night terrors and extreme dependency	11	39	0	22	0
2. G.P. (girl): Intense fears of being poisoned; of being alone; school fears and night fears	12	30	0	28	0
3. P.L. (girl): Rigid, obsessional child; phobic systems, night fears	9	39	0	26	0

It must be stressed that these reactions were extreme and unusual, and the children who gave such responses were among the most disturbed in the clinic.

Paranoid Tendency

Examples of this rare reaction, which was seen only in two cases, are given in Table II. In both an underlying psychotic disturbance was suspected. The children were described as "suspicious" and "always imagining things, usually the worst"; one of them had fears of being abducted.

Table II

Projection of Negative Feelings

	Outgoing+	Outgoing−	Incoming+	Incoming−	Self
A.M.	8	2	0	16	6
P.N.	12	1	0	18	5

The main difference from the "rejection" syndrome described below is the presence of outgoing kindly feelings associated with very little hostility. The experience of negative incoming feelings was out of all proportion to the "actual" feeling assessed psychiatrically. In both cases the parents were described as "Neurotic", but warm and considerate to their children. Neither family had used punitive measures.

Egocentric States, Auto-aggressive Variety

A negative attitude towards the self is a test abnormality found in children imbued with a strong sense of their own "badness". They tend to belong to the group clinically labelled "rejected", and they are usually unwanted and unplanned children who have suffered a separation in some form.

P.H., a boy aged eight, spent his first year in a nursery, his mother being ill with rheumatic fever, and his father away at the war. His conception had been a great shock to the mother who did not consider herself ready to have children, even apart from considerations of illness. He passed the first four years in and out of nurseries, becoming increasingly disturbed. At four he had his arms splinted for the joint offences of masturbation and stealing. When he returned home at five, his mother made no allowances at all for the facts of separation, and treated him as a very naughty child. She found it difficult to control her own violent temper, but expected the child to control his. He, for his part, was hopelessly jealous of a small brother who had never left home. He seemed to be intensely insecure and had violent outbursts over which he suffered much guilt, and he implored his mother not to send him away as a punishment. In his repeated nightmares, he was constantly being attacked and mutilated. He often beat himself, pulled his hair out, bit his hands, and expressed the wish to be dead. He seemed to be especially prone to small accidents. Some of his tests results are given with two other cases in Table III.

TABLE III

Auto-aggressive Feelings

Case	Status	Case Record of Rejection	Auto-aggressive Habits	Self+	Self−	Maternal Over-protectiveness
P.H.	Elder of two.	Rejecting mother.	Beating self, hair pulling, self biting, accident prone, self death-wish	0	8	0
P.D. (girl) 14	Elder of two girls.	Deserting mother. No father.	Pulls hair out, bites nails, said to make martyr of self ..	0	9	1
M.M. (girl) 9	Eldest of three.	Rejected by both father and mother (questionable paternity).	Has bitten self; often makes lips bleed; asks to be smacked when naughty	0	8	0

Egocentric States, Auto-erotic Variety

A very positive attitude towards the self is occasionally found in children who are over-privileged, over-indulged, and generally over-stimulated. Such children are called "over-protected" by the clinician, and "spoilt" by the layman. Examples of this condition which is commoner than the auto-aggressive variety, although it mainly occurs in the cases of girls, are given in Table IV.

Table IV

Auto-erotic Feeling

Case	Status	Case Record of Indulgence	Auto-erotic Habits	Self+	Self−	Materna Over-protectiveness
J.K. (girl) 8	Only child.	Very spoilt by both parents.	Thumb-sucking, voracious, sweet eater, nose picker, masturbation	14	2	2
P.L. (girl) 8	Only child.	"Centre-piece" of family; "completely spoilt".	Anal retention and masturbation; thumb-sucking at night, day wetting; tantrum if frustrated	10	0	6
V.S. (girl) 9	Eldest of three.	Father's favourite; much indulgence with gifts.	Marked greediness, sweet eater, masturbation	8	3	0

V. The Discovery of Significant Figures

One of the ways in which the Family Relations Test has shown its usefulness has been at the initial diagnostic conference in the Child Guidance Clinic. Not infrequently it brings out with great clarity some extreme and unsuspected emotional interest on the part of the child, thereby throwing much light on its behaviour and symptoms. We will give four examples illustrating this.

D.A., aged 12, is the youngest of four children and is the only girl in the family, with a sibling gap of 10 years between her and the nearest child. Consequently, she was a lonely girl, generally left to her own devices and much given to day-dreaming. About seven months prior to referral, she had complained suddenly of colicky pain and swelling of the lower abdomen. On careful examination nothing abnormal was found, and it was thought that the swelling was due to intermittent intestinal and/or urinary retention of excretory products. The paediatrician diagnosed the condition as "functional" and referred the case for psychological opinion. At the diagnostic conference, it was noted that the girl "walked like a pregnant woman" with her hands crossed complacently in front of her abdomen. The psychosomatic background was explored, and it was revealed that the mother had been treated for neurotic dyspepsia fifteen years previously, and that the father had been operated on for a stomach ulcer more recently. Her very anxious mother tended to over-indulge her especially with regard to food, as a result of which the girl was extremely faddy in her tastes, and prided herself on a sensitive stomach. "I can feel everything in my stomach" she would often say. It was difficult on the basis of these identification patterns to make even a tentative aetiological statement. At this stage of indecision the results of the family test were produced. (It had been arranged that the child was always tested, for convenience, during the period of the conference so that the results were available at the end of the clinical discussion. It also ensured that the testing was done "blind".)

Table V

Distribution of Feelings by D.A.

	Outgoing+	Outgoing−	Incoming+	Incoming−	Degree of Involvement
Father	0	5	0	4	9
Mother	5	0	2	0	7
Sibling 1	2	0	2	2	6
Sibling 2	0	3	1	3	7
Sibling 3	2	2	0	2	6
Sister-in-law	1	0	2	0	3
Sister-in-law's baby ..	8	0	7	0	15

It will be seen from Table V that the girl had become heavily involved with a peripheral member of her family group who was not mentioned at all at the preliminary conference. On obtaining this test information, the matter was further investigated, and it was found that the onset of the girl's symptoms coincided with the birth of the baby, which had taken place in the room next to her bedroom; that a few months prior to the birth, she had broken her habitual reserve and questioned her mother in great detail about the mode of pregnancy and parturition; that her pains mostly came on during the early part of the night at about the time of the confinement. When asked, during her therapeutic sessions to state her "three wishes", her first was for a baby, "but not if you have to get married for it", because she did not want to leave her mother who, she felt, was very unhappy with her "crosspatch" father. She was still perplexed about parturition, and said that she thought it was very painful as she had heard her sister-in-law groaning a lot. A girl at school had told her that "it" came out through the back passage and that you had to be sure to keep it in, because if it came out too early it would just die. After a few sessions, during which her facts and fantasies were fully aired, she lost her presenting symptoms. A diagnosis of *hysterical pseudocyesis* was then made. This is an example of the way in which the test can discover a significant person in the life of the child.

T.S., a 12-year-old girl, was suffering from a multitude of fears, the greatest of these being a dread of being left in the house when her mother was out. The mother-child relationship seemed to be a very close one, the pre-pubertal girl being in a state of infantile dependency. Her primary symptom oscillated between the fear of something terrible happening to her when her mother was not there, and a fear that something equally terrible would happen to the mother in her absence. It was immediately clear at the diagnostic conference that the mother was a phobic subject, whose own set of fears bore a strong resemblance to those she reported in her daughter and which she, no doubt, communicated directly to her over the course of years. It was not so clear, however, why the present crisis that had brought the child for treatment had arisen, and this we were to find out through the agency of the test. Her item distribution is shown in Table VI.

TABLE VI

Distribution of Feelings by T.S.

	Out-going+	Out-going−	In-coming+	In-coming−	Degree of Involvement
Father	7	1	5	2	15
Mother	8	1	6	0	15
Sibling	5	1	4	1	11
Maternal grandfather	6	6	7	5	24

Table VI shows the presence of an important figure not mentioned at the conference. It indicates a strong pre-occupation with the maternal grandfather, and a marked degree of ambivalence to him. What was even more significant from the clinical point of view was that the incoming feeling from the grandfather consisted of a curious mixture of "sexual" and aggressive items.

With this in mind, the mother was questioned about her father. He was a widower who had come to live with the family after the death of the grandmother five months previously, that is, about two months before the girl's illness had begun. The mother very much regretted having had to take him in. She had always been extremely frightened of him, dating her fear from an incident in her childhood in which she was certain he had "interfered" with her. It was difficult to establish with this highly neurotic woman how far this recollection was founded on fantasy or fact, but there was no denying her present state of apprehension with regard to his overbearing behaviour. She said that she still felt like a child in his presence, expecting to be taken over his knee and walloped without cause. She had heard ugly stories of his dealings with women even during the lifetime of the grandmother, and she felt that there was nothing he would not attempt. It required little psychological exploration to demonstrate her very mixed feelings in the matter. She was afraid of her father but would not let him live elsewhere than with her; she thought that he might do violence to her, yet she frequently spent the evening alone with him in his room.

In her treatment, the girl revealed that she was often left alone with her grandfather in the first two months after his coming, and during these times, he had sometimes tried to "cuddle" her to her great distress. On one occasion she had run out of the house but had not told her mother because she felt that she might have been angry with her. She knew that her mother was afraid of the grandfather, and sometimes at night she imagined that she heard him going down the stairs when her father was on a night shift, and she was then panic-stricken in case he hurt her mother. When asked whether she liked him, she was doubtful, declaring that at times he was very nice and gave her more presents than her father gave her. She wanted him to go, but she thought she might miss him when he went.

These case reports illustrate how efficiently the test can help to localize a disturbing influence in the home environment, and how accurately it reflects the nature of the particular disturbance.

VI. Assessment of Inhibition

The reason why the items express both mild and strong feeling is to enable the subject to grade his responses in two directions; in the number of items that he placed and in their intensity. The number and kind of items used by him indicate the manner in which he handles his emotions. If due allowances are made for factors which modify the expression of feeling such as age and sex, and for factors which modify feeling itself, such as strong environmental stimulations, then the degree of inhibition found in the test responses can be related to clinical inhibition and to behaviour.

Emotional disturbances can be scaled along an axis, the poles of which can be taken to represent extreme forms of inhibition and dysinhibition. The inhibited child is more liable, on the whole, to express his emotional conflicts in terms of bodily dysfunction, such as eating, sleeping, eliminating and motor activity, or he may develop psychosomatic symptoms. In contrast, the dysinhibited child tends to express his emotional conflicts in terms of environmental disturbances, such as aggressive or delinquent behaviour. On the scale of aggression these represent the intra-punitive and extra-punitive modalities. The general expectation would be that the inhibited child would show less involvement with his environment, and more with himself. The little he does express should be mild and evenly spread out so that no one is antagonized and no loyalties imperilled. Aggression should be mainly absent or intra-punitive. The dysinhibited subject would be expected to be heavily involved with his environment, and to be much less pre-occupied with himself, unless feeling himself to be unwanted and rejected. He should not be defensive about expressing his strong feelings or in indicating his overwhelming concern with particular people. His aggression should be more extra-punitive in character.

The reader will have noticed that greater emphasis is placed on the negative expression of feeling. Experience has demonstrated that the crucial emotional difficulty for the clinic child is more often in the expression of hostile than of loving feelings. Consequently the use made of the negative items gives, in general, a more accurate assessment of the inhibitory state.

Both positive and negative test responses can be graded along a five-point scale ranging from strong inhibition to strong dysinhibition. The steps on this scale can be defined in an operational manner, so that the subjects can be given objective inhibition scores. The distribution of 90 clinic cases according to the negative scale of inhibition was as follows:

1. Strong Inhibition	2. Mild Inhibition	3. Average Inhibition	4. Mild Dysinhibition	5. Strong Dysinhibition
4	25	51	8	2

This gives a distribution curve skewed towards the inhibited side, which supports the clinical impression that there are greater numbers of inhibited than dysinhibited among the disturbed children.

The subjects can also be scored according to the degree of inhibition their behaviour showed during testing. This second inhibition score is based on the subjective assessment of the tester.

Experience with the test indicates that the steps on the negative inhibition scales can roughly be equated with diagnostic categories. These equations are given in Table VII.

TABLE VII

Frequent Relationships Between Inhibition Scores and Diagnostic Categories

Inhibition Scores	Diagnostic Categories
1	Certain cases of infantile psychoses; severe phobic states.
2	Over-protection syndrome; habit disorders, tics; psychosomatic conditions; obsessional states.
3	Mild behaviour disorders; mild conduct disorders.
4	Delinquency; organic syndromes; maladjustment; hysterical states.
5	Rejection syndrome; some cases of psychoses.

Our observations indicate that the test-inhibited child reacts "true to form" in his general life situation and symptomatic behaviour, although the degree of inhibition may show some variation. An inhibited record usually points towards an inhibited child. From this it does not follow that all inhibited children produce inhibited records. Some children, who are mildly inhibited, are able to express more feeling in the test situation than they can under other circumstances, and their test responses are mildly dysinhibited.

VII. THE VALIDITY OF THE FAMILY RELATIONS TEST

The validity of the Family Relations Test has been investigated from several points of view. Although the number and variety of these investigations is far from sufficient, the results obtained seem to justify some reasonable confidence in the test.

Two sets of subjects were used for the validation studies. They both consisted of children who were out-patients in the children's department of a large hospital in South East London, and who had been referred there for any of the reasons that are usual with child guidance cases. Most children came from working-class or lower middle-class homes. Their I.Q.s ranged from 67 to 144 with a mean of 98 and an S.D. of 16. As there were not enough young children available for the study of the form for younger children, all validity studies were done on the form for older children with subjects who were from 7 to 15 years old with a mean age of 11·0 years.

The first set of subjects were used to compare various aspects of the test results with relevant psychiatric and case-history material. The test was administered to newly admitted out-patients, and about a year later the test results were compared with the case material that had been compiled by psychiatrists and psychiatric social workers. The second set of subjects consisted of out-patient cases at a later time. The test results of these children were compared with questionnaire material obtained from their mothers.

1. COMPARISONS BETWEEN TEST RESULTS AND CASE-HISTORY MATERIAL

Did the children's test responses reflect feelings their parents were reported to have towards them?

To see how the Family Relations Test reflects relatively well-documented parental attitudes the test results of ten children were examined whose fathers had been described by social agencies or by the mother in question as hostile, punitive, cruel, unpleasant to the children, constantly scolding or nagging at them, disliking them, ridiculing them, etc.

From the children's test records we divided the "feelings coming from father" into three groups:

A. Predominantly positive, i.e. over two-thirds of the items were positive.
B. Ambivalent, i.e. neither the positive nor the negative items exceeded two-thirds of their combined number.
C. Predominantly negative, i.e. over two-thirds of the items were negative.

The children's assessment of their fathers' feelings towards them is shown in Table VIII.

TABLE VIII

Children's Test Responses Regarding Incoming Feelings from Hostile Fathers
(N=10)

	Over 66 Per cent. Positive	Ambivalent	Over 66 Per cent. Negative
Test responses ..	0	2	8

It would seem that the fathers' hostile feelings were correctly appreciated by their children, and reproduced in the test situation without much reluctance.

A careful psychiatric assessment based on case study material was made of 16 mothers who had expressed strong positive feelings towards their children. The mothers were divided into two groups. The division was based on the following attitudes extracted from the case records or obtained in interview with the mother.

Group A. Seemingly normal acceptance of the child. Attitudes conforming with such remarks as: "I've always wanted them even when they were naughty"; "They're little devils, but I wouldn't be without them for the world"; "I look forward to week-ends and holidays—it's so nice to have them around even though they make so much extra work"; etc.

Group B. Covert, over-compensating rejection of the child. Attitudes conforming with such remarks as: "We didn't want them to start with—I've never been one for children—but we've done the best we could for them and I hope they'll be grateful for it"; "They get everything they want the minute they ask for it"; "I'm always worrying over him—I've killed and buried him a thousand times—whenever he gets out on that road I'm thinking that he's never going to come back"; "They get everything they want and I have to go without; my husband says I'm killing myself for them, but I feel really bad if I can't give them everything"; etc.

The children's assessments of their mothers' feelings are shown in Table IX.

TABLE IX

Test Responses Referring to Incoming Feelings from Mothers

	Over 66 Per cent. Positive	Ambivalent Response	Over 66 Per cent. Negative
Group A (9)	8	1	0
Group B (7)	1	4	2

The null hypothesis stating that the two samples could have been taken from the same population was rejected at the 5 per cent. level of confidence. (Corrected for small frequencies.)

Did the feelings the children expressed towards their siblings correspond with those they supposedly had towards them?

Twenty-five cases, who had older sisters and brothers, were taken at random and an assessment was made of their outgoing feelings with respect to their immediately older siblings. Siblings were taken for investigation of outgoing feelings because we wanted to compare our test results with case material compiled by psychiatric social workers, who obtain their information from parents; and parents can speak more objectively of their children's feelings towards one another than towards themselves.

The reported feelings towards the siblings were divided into three groups:

A. A positive group, conforming with such reports as: "Very fond of each other; go everywhere together; play well together; share their toys; enjoy each other's company; are miserable without each other"; etc.

B. An ambivalent group, conforming with such reports as: "Have their ups and downs; the one minute they are bashing each other and the next moment they are friends; fight like cats and dogs but can't seem to live without each other"; etc.

C. A negative group, conforming with such reports as: "They can't seem to stand each other at all; are always nagging at each other; can't leave them together—would kill each other; it's like a red rag to a bull; sometimes I think they hate each other"; etc.

From our test records we subdivided the outgoing feelings in each group into predominantly positive, ambivalent and predominantly negative ones. Table X shows the reported and obtained sibling reactions.

TABLE X

Reported and Obtained Feelings Towards Siblings

Feelings Obtained by Test	Over Two-thirds Positive	Ambivalent	Over Two-thirds Negative	Total
Over two-thirds positive ..	6	2	1	9
Ambivalent	1	2	3	6
Over two-thirds negative ..	0	2	8	10
Total ..	7	6	12	25

The agreement between the reported feelings and the feelings expressed in the test is 64 per cent. which is significantly different from chance at the 5 per cent. level of confidence.

Did the children's test responses correctly reflect conflict situations with siblings?

This investigation was carried out on a series of cases in which sibling jealousy had been listed among the mother's presenting complaints. Whenever possible, the father's opinion was also used to confirm its existence, intensity and direction. In general, agreement on all three features was high between the parents.

For purposes of comparison, we have limited our selection to families with three or more children. For each case we have recorded the sibling defined in the complaint and the outgoing and incoming negative test feelings for each sibling.

TABLE XI

Conflict Between Siblings as Presenting Symptoms and as Shown by the Test

	Case	Reported Sibling in Conflict	Negative Feelings (Outgoing and Incoming)			
			Sibling 1	Sibling 2	Sibling 3	Sibling 4
1	P.H.	Sibling 2	1 3	*10 10*	Pt.	—
2	L.R.	Sibling 1	*8 6*	Pt.	4 3	—
3	B.B.	Sibling 1	*10 6*	3 1	Pt.	1 0
4	M.L.	Sibling 2	Pt.	*15 1*	0 1	1 3
5	L.M.	Sibling 2	Pt.	*7 3*	3 2	0 2
6	E.I.	Sibling 3	7 4	Pt.	*6 5*	—
7	C.R.	Sibling 2	Pt.	*6 0*	2 1	—
8	T.R.	Sibling 1	*10 1*	Pt.	2 1	0 0
9	R.S.	Sibling 1	*4 5*	Pt.	0 1	—
10	R.M.	Sibling 1	*9 8*	Pt.	1 0	1 0
11	C.M.	Sibling 3	2 3	Pt.	*12 4*	0 1
12	R.J.	Sibling 1	*6 6*	Pt.	3 0	2 0
13	J.B.	Sibling 2	0 4	*6 3*	Pt.	1 0
14	J.R.	Sibling 2	1 0	*3 1*	Pt.	0 0

It will be noticed that apart from Case No. 6 there is full agreement between the social inquiry and the test findings, and that there is a clear difference between the siblings with regard to the size of the negative response. The 14 siblings upon whom the diagnosis "sibling jealousy" is based share 171 negative items (12·2 per sibling) as compared with the 23 neutral siblings who share 65 negative items (2·8 per sibling).

2. CORRESPONDENCE BETWEEN THE TEST RESULTS OF CHILDREN AND QUESTIONNAIRE MATERIAL OBTAINED FROM THEIR MOTHERS

The test was administered to unselected children who were out-patients at the hospital at a given time. At the same time the mothers of children attending the hospital were asked to answer questionnaires concerning the children's feelings towards their fathers and siblings, and the fathers' and siblings' feelings towards the children. Although mothers are frequently unreliable informants, the assumption was put forward that they might be able to give reasonably well-observed reports on their children's feelings concerning other members of their families, though it was thought advisable not to ask the mothers to estimate their children's feelings in relation to themselves.

The comparison of the questionnaire material with the test responses was made by a psychologist who was not directly involved with the test. It should be borne in mind that for each child there were 60 scores or more, while there were only ten questions for the mothers, so that only very partial comparisons were possible. It should also be pointed out that the comparisons were not based on the same data in each case, as the mothers varied in the clarity and the amount of information they gave. Most mothers made two or three statements which were clear and definite enough to allow for comparison with their children's records, but some mothers left most of the questions blank, or only gave vague, evasive answers. Similarly, some of the children took refuge behind a great many "Nobody" responses.

Altogether, 44 cases were available in which both the mother and the child supplied information. Of these, 10 cases were considered to be useless because of lack of information. The remaining 34 cases were evaluated subjectively as shown in Table XII.

TABLE XII

Comparisons Between Mother's Questionnaire Responses and Children's Test Responses

	Per cent.	Cases
Poor agreement	15	5
Partial or fair agreement	38	13
Good agreement	47	16
	100	34

Taking various conflicting considerations into account, Table XII suggests that the test can give an estimate of children's family relationships, which is roughly in agreement with the accounts given by their mothers.

Are the test results influenced by the sex of the person who administers the test?

It could be the case that the sex of the person who administers the test influences the feelings which the children express towards their fathers and mothers. It seemed therefore necessary to compare test results, obtained by male and female psychologists, from this point of view. Since having a male or a female examiner may have a different effect on boys than on girls their records should be compared separately.

The first group of children whose test results were used in the validation studies had all been tested by a female psychologist. From the second group about half had been tested by a male and half by a female. Unfortunately there were not enough girls in this group to make comparisons worth while and so they had to be restricted to boys. Table XIII shows the mean number of items used with regard to each parent when the test was administered by a male and when it was administered by a female psychologist.

TABLE XIII

Mean Number of Items Given to Parents by Boys

	Male Psychologist	Female Psychologist
Mild positive feelings from boy to father	3·14	3·00
Mild positive feelings from boy to mother	4·07	3·88
Mild positive feelings from father to boy	2·65	2·88
Mild positive feelings from mother to boy	4·17	4·51
Strong positive feelings from boy to father	1·07	1·07
Strong positive feelings from boy to mother	2·37	2·09
Strong positive feelings from father to boy	0·72	0·76
Strong positive feelings from mother to boy	2·24	1·76
Mild negative feelings from boy to father	2·52	2·49
Mild negative feelings from boy to mother	0·79	0·76
Mild negative feelings from father to boy	1·86	1·64
Mild negative feelings from mother to boy	1·07	1·12
Strong negative feelings from boy to father	0·52	1·03
Strong negative feelings from boy to mother	0·10	0·27
Strong negative feelings from father to boy	0·58	0·79
Strong negative feelings from mother to boy	0·24	0·21
Over-indulgence of child by father	0·96	0·94
Over-indulgence of child by mother	0·96	1·00

Test given by male, N=29. Test given by female, N=33.

None of the differences between the means obtained by the male and the female psychologists were found to be statistically significant.

VIII. The Reliability of the Family Relations Test

None of the usual methods of assessing the reliability of a test are quite suitable for the Family Relations Test. If the test-retest method is used with a short interval, the child may be influenced when tested on the second occasion by his memory of the first occasion. If this method is used with a long interval, then we must expect changes both in the home environment of the child and in the maturing child himself. This is especially true in the case of clinic children who are in therapy, and whose mothers are seen by psychiatric social workers.

Nor is the split-half method very suitable for this test, since the items within any area are not sufficiently homogeneous and since the number of choices the child can make with regard to each item varies from case to case. However, an attempt has been made to use a modified form of this method in the following way:

The test consists of 86 items, each of which could be allotted to Nobody, Self, Father, Mother, various numbers of Siblings and Others in the family. Out of this, by a combination of items, three types of scores were used:

Positive feelings, to and from combined.
Negative feelings, to and from combined.
Over-protection and Over-indulgence combined.

Separate reliability coefficients were obtained for each of these scores for each of the people in the family, and regarding each score two sub-scores were computed, for the odd and for the even numbered items respectively. (This was done only where the total score for the member of the family reached or exceeded 6 within the area.) Thus, for each subject, we have two separate sub-scores for positive feelings in relation to Father, two separate sub-scores for positive feelings in relation to Mother, and so on. The number of subjects who gave 6 or more items to self, second or third mentioned siblings, and others in the family was too small to warrant computation of a coefficient.

The statistical results are shown in Table XIV.

Table XIV

Correlations Between Odd and Even Numbered Items Where Total Number of Items Per Person and Area Reached or Exceeded 6

	N	r	Corrected r
Positive Feelings:			
Father	48	·66	·79
Mother	76	·65	·79
First mentioned sibling	34	·82	·90
Negative Feelings:			
Father	31	·71	·83
Mother	11	·64	·78
First mentioned sibling	31	·52	·68
Over-protection and Indulgence:			
First mentioned sibling	17	·67	·80

To correct for halving the length of the test, the Spearman-Brown prophecy formula was used.

These results seem to indicate that the Family Relations Test is reasonably reliable.

It would have been desirable to check the reliability of the test and to establish norms for it on a normal school population. This was not done because the test has to do with intensive and intimate feelings, and the parents of many children might have objected to such an invasion into their private lives. Norms based on a clinic population made up of children with various difficulties in interpersonal relationships would be influenced by extreme scores to an unknown degree. It is hoped, however, that norms established on homogeneous clinical groups will be forthcoming in the future.

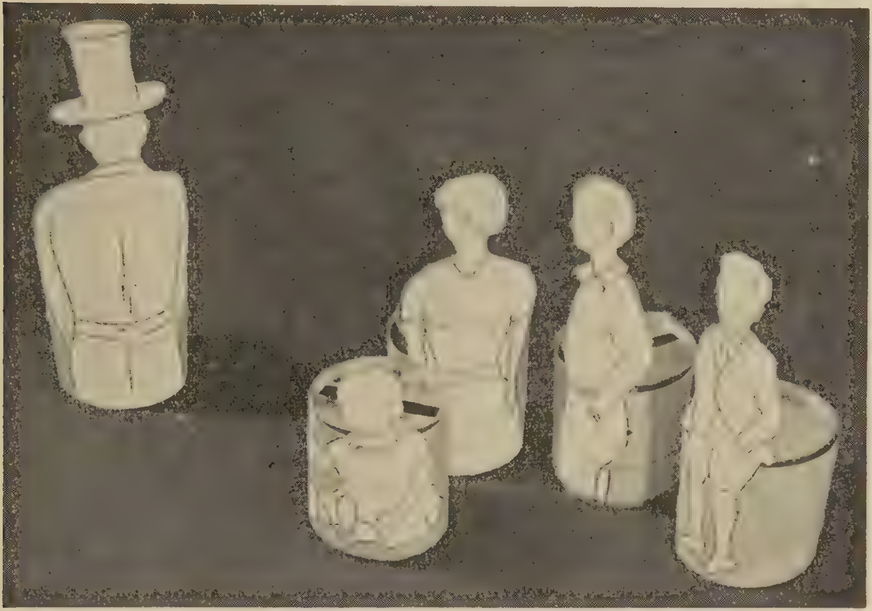

FIG. 1.

SUMMARY

A description is given of a new technique for exploring the "climate" of feeling which children experience in their homes and which is so often found to play a decisive part in the genesis of their psychological symptoms.

A special standardized play situation is used, comprising representative family figures (see Fig. 1) into whom printed sentiments of various positive and negative kinds are inserted.

The method makes it possible to assess quantitatively both the child's feelings towards the members of his family, as well as the feelings he believes that the members of his family have towards him. In addition, the test is equipped with devices for appraising egocentric attitudes and the strength of defences against emotional expression. The results can also indicate the degrees of involvement with different members of the family circle, the extent of the inhibition or dysinhibition of positive and negative feelings, and the character of interpersonal relationships, whether predominantly positive, negative or ambivalent. It can also reveal the presence of discrepancies between in-coming and out-going feeling, which may be of diagnostic importance.

Comparisons of test results with case history and questionnaire material show reasonably good agreement. The odd-even reliability coefficients obtained for various parts of the test are around 0·80.

A FURTHER EXPERIMENTAL STUDY OF USING PERCEPTUAL ERRORS AS AN AID TO DIAGNOSIS*

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INTRODUCTION

SOME neurotic patients exhibit such a complex symptomatology that it is often difficult to determine, by present methods, which problems or areas of difficulty are fundamental. Much time may therefore be lost through the treatment of superficial rather than basic sources of difficulty.

In a previous paper (Walton, 1954) an attempt was made to discover whether an experimental technique, developed by Rosenstock (1951), could be modified so as to be of diagnostic assistance in such problems.

Rosenstock's investigation was concerned with the experimental validation of the psycho-analytic conception of repression. By means of a perceptual experiment he attempted to show that repression and perception were closely connected, and that the effects of repression could be observed in perception.

He hypothesized that:

(1) Under a sufficiently low degree of illumination repressible† material will not be perceived.

(2) Under a sufficiently high degree of illumination this material will be perceived by most subjects. Some subjects may be so affected that the external forces never become great enough to structure the perception in accordance with the stimulus distribution.

(3) Between the two stages there will be areas of uncertainty during which the material will be distorted to a greater or lesser degree. The distortion will be of such a nature as to reduce affect, i.e. in the direction of the perception and report of material less charged with affect.

(4) The threshold for perceiving the material correctly will be greater than for the perception of material unrelated to previous repression.

In his experiment eight sentences were used. Each was matched and contained 14 words and 18 syllables. The form of each sentence was the same, the second clause containing the affective meaning, while the first clause served as modifier. In order to hold constant "the structural difficulties" of the sentences each experimental sentence was matched with a control sentence on the number of meaning units contained in the second clause. The experimental sentences contained sexual and aggressive impulses directed at one or both parents, whilst the control sentences comprised other non-pleasant material, though avoiding as far as possible sexual and aggressive meanings.

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* Based on papers read to the Northern Branch of the Committee of Professional Psychologists (M.H.) of the British Psychological Society, in the Department of Studies in Psychological Medicine, University of Liverpool, on the 1 October, 1955; and to those attending a symposium on "The Role of the Clinical Psychologist in the Health Services" held at the Institute of Psychiatry, Maudsley Hospital, London, in May, 1956.

† In the absence of objective criteria for the assessment of repressible material *a priori* judgments were made of the repressibility of the experimental material. The construction of the sentences was guided by the relative agreement among psycho-analysts that sexual and aggressive attitudes towards the parents are those primarily repressed.

The subjects were all volunteers from first and second courses in elementary psychology. They were mainly sophomore and junior students, and, in general, knew little about basic psycho-analytic postulates.

The experimental procedure was for the sentences to be projected tachistoscopically on a screen at seven graded steps of illumination. Each slide was exposed for 3 seconds. The intensity of the illumination was varied by changing the resistance within the circuit. All the sentences were presented at step 1 (minimum illumination) then all at step 2 and so on. The slides were presented in random order at each grade of illumination to avoid practice effect. The subjects were allowed as much time as they wished to write down what they saw of each sentence.

His conclusions were "Most subjects see the experimental material only after the external organizing forces become relatively great. It appears that forces exist within the individual which prevent the appearance in consciousness of certain kinds of material, among which are sexual and aggressive material."

A patient who, clinically, presented a series of difficulties centred round the parent-child relationship, sexual adjustment and correct vocational placement provided a difficult diagnostic and therapeutic problem (Walton, 1954). It was impossible in the early stages of the psychiatric investigation to determine the fundamental source of this patient's difficulties. From the discussion between psychiatrist and psychologist the main problem emerged, that of deciding which of the patient's difficulties was basic to his illness and consequently which should be treated the first.

It became at once apparent that there was no adequately standardized and validated test available to help in this problem. It was also apparent that the use of a standardized and validated test was not the only way of testing hypotheses formulated to account for the patient's behaviour. There was in fact the method of experimental investigation, a method about which Shapiro (1951) has unfortunately but rightly to say ". . . . in the field of diagnosis . . . is almost non-existent".

The literature was then searched in an attempt to find a technique which could be modified so as to be of diagnostic assistance in this problem. Rosenstock's work on the validation of the concept of repression was noted.

Subsequently all known additional clinical features presented by the patient, including his life history and medical history were integrated. Eight sentences directly relating to the known emotional difficulties of the patient were then formulated. Two matched neutral sentences were used as controls. Each sentence contained the same number of words and was at an approximately similar level of difficulty. A tachistoscopic projector with a 3-inch time exposure was used in projecting these sentences at seven graded steps of illumination. In a way somewhat similar to Rosenstock it was hypothesized that the basic source of difficulty should be clearly differentiated from the others by it giving rise to a significant increase of errors or distortions. The neutral sentences being non-emotional would be perceived earlier, at lower levels of illumination and with fewer errors than the matched affectively loaded sentences.

There was no significant difference between the correct score means of the neutral and affective sentences (variance ratio, ·309). The error scores, however, showed a difference between neutral and parent-child sentences which was highly significant (t=7·45, significant ·01 level). It suggested that the parent-child relationship might be the source of greatest difficulty. The validity of this tentative conclusion was supported by the results of subsequent detailed clinical exploration during the following year and supplemented by an investigation of the patient involving a home visit, and an interview with his employer. They pointed to an unsatisfactory parent-child relationship being the basic factor.

The above investigation, using only a single case, was supported on the grounds that it satisfied the three criteria essential to any experimental investigation (Shapiro, 1951; Zubin):

(1) The phenomenon was brought under control.

(2) Precise predictions of behaviour or experience under new conditions were made possible from the hypotheses which were developed.

(3) The hypotheses which were formulated provided a beginning of an explanation for the phenomenon concerned.

The criterion of "control" was met in that the increased error scores or distortions were related to the basic source of difficulty. In proportion as the material presented was non-emotional so was there a decrease of errors. With an increase in traumatic material so was there an increase in error scores.

On the basis of these results it is now possible to satisfy more adequately the second criterion. If the above findings are generally valid then it should be possible to predict that there would be an increase in errors and distortions in other patients providing the sentences refer to relevant emotionally traumatic and disturbing content. It was with this aim in mind that the present investigation was undertaken using a group of sexually disturbed subjects. The sexual sentences should clearly give rise to a significant increase in errors and distortions compared with the remaining sentences.

THE EXPERIMENT

Material

Seven sentences were used in the experiment. Five of these served as experimental sentences, the remaining two as controls. The experimental sentences described difficulties in the parent-child relationship and in sexual adjustment. The control sentences were neutral. A list of the sentences appears in Table I.

Each sentence was matched for the same number of words and approximate level of difficulty. Each was photographed on a 2 inch × 2 inch slide. The sentences were in black on a white background.

A standard "Pullin" projector with a 250-watt lamp was used. A Compur shutter, fitted to the nose of the projector and used at full aperture, controlled exposure time. The timing, which remained constant throughout the experiment, was 3 seconds.

The light source or degree of luminosity was controlled by a "Variac" transformer, the increases in illumination being measured by voltage change. The lowest level of illumination corresponded to 35 volts. Each higher level of illumination was equivalent to an increase of 5 volts.

The sentences were projected on a ground glass screen.

TABLE I

Control Sentences

1. The forecast for the winter months in London is one of extreme cold.
2. There is a very good film being shown at the Odeon cinema today.

Experimental Sentences

1. A very large number of people are guilty of very bad sexual conduct.
2. Many people wish that they were not bothered about sex and related matters.
3. When a man is with a woman he usually thinks of sexual things.
4. Many people treat their sons more like a child than a grown-up.
5. Many parents and people find much more fault with children than they should.

The Subjects

There were nine psychiatric patients, all suffering from sexual disorders or difficulties—obscene letter compulsion; inability to ejaculate, with a suggestion of homosexuality; inability to micturate in public; transvestism, passive homosexuality, exhibitionism; homosexuality; male prostitute; legal prosecution following mutual masturbation in a public place; exhibitionism; active homosexuality (sexually interfered with boys in his classroom—now imprisoned).

Three normal subjects took part in the experiment and acted as additional controls.

Procedure and Instructions

Each of the seven sentences was shown at the same level of illumination before going on to the next. At each higher level of illumination the order of presentation was varied to avoid practice effect. There were 10 grades of illumination, ranging in units of 5, from 35 to 80 volts. After each projection the subject folded his paper so as to avoid seeing his previous answers. He was allowed as long as he wished to write down what he saw of each sentence.

The instructions given to the subjects were "This is a test of visual perception. I am going to present you with a series of sentences which will be projected on to a screen. You will see each one for three seconds. After each exposure I want you to write down what you saw of the sentence. If you cannot read the whole of the sentence and only part of it write down what you saw. I am going to start at the lowest level of illumination and gradually work higher. Are you ready?"

ANALYSIS OF DATA

The subjects' responses were scored according to the following criteria:

(1) One correct score is equivalent to any word that is perceived correctly, irrespective of whether it forms part of a continuous sentence or not.

(2) One error score is the inclusion of a word not in the original sentence.

Examples of different reactions to the projected sentences, taken from the present investigation and the work of others, are:

(a) *Projective Errors*

This is where the original sentences are distorted and structured according to the needs and attitudes of the individual—". . . the obtained distortions can be interpreted much in the same manner as the data of projective techniques" (Rosenstock, 1951).

The two most striking sets of "projective errors" in the present study were obtained from two homosexuals in response to the sentence, "When a man is with a woman he usually thinks of sexual things". The first subject's responses were:

Level of Illumination

1. . . . . . . man is with . . . . . .
2. When a man . . . .
3. When a man live . . . .
4. When a man is a . . . .
5. *The man is a woman* . . . . . .
6. *When a man is a woman hoax* .
7. Sexual . . . . . . S . . . .
8. When a man is sexual . . . . .
9. When a man is with a woman .
10. *The man is a woman for sex* . .

"Projective errors" from the second homosexual were: "*Man is a woman usually*"; "*Is a man with a woman usually?*"

A further example of a "projective error" is taken from Rosenstock. The projected sentence was, "As I clung helplessly to mother I was taken to school the first day". The subject reported seeing, "As I clung helplessly to mother—taken the alcohol".

(b) *Increase of Intensity of Attitude*

A good example of this was in relation to the sentence (Rosenstock), "Whenever I tracked dirt and mud in the house I was scolded by mother". This sentence became, "Everywhere I looked, dirt and mud". Another subject increased the intensity of the latter sentence for it to read, "Whenever I tracked dirt or mud in the house I was slapped by mother".

(c) *Decrease of Intensity of Attitude*

In general distortions appear more in the direction of the reduction of intensity. The projected sentence was, "Many people wish that they were not bothered by thoughts of sex and related matters". One subject reported seeing "They wish they were not gathered together . . . ". Similarly the word omissions are most significant for the sentence, "A very large number of people are guilty of very bad sexual conduct"—"Very large number of people are guilty of . . . sexual conduct"; "Very large number of people are guilty of . . . sex".

Rosenstock gives several interesting examples of "decrease of intensity". A common example concerned the sentence. "When I was young I often had happy dreams of sleeping with my mother." One subject reported seeing this as, "When I was young I often had happy dreams of mother". Affect was also reduced by changing the object of the attitude—"I hoped I would die an awful death". This sentence was reported rather than, "Though mother treated me well I sometimes hoped she would die an awful death".

A further example of reducing affect is changing the concept. The projected sentence was, "My parents were in bed and I jealously wanted to kill them for it". This was reported as, "My parents were not bad and I jealously felt". Eriksen (1951) using tachistoscopic presentation of scenes showing people in the act of expressing or gratifying certain needs noted certain trends. He found a common tendency, similar to Rosenstock's findings concerning the changing of concepts, to change the scenes in such a manner as to remove the threat. For example, two men fighting with knives was seen as two baseball players with large catchers' mitts in their hands. Another shows a man bent over from the waist, picking a flower. A man directly behind the first, is looking at the first man's buttocks. The man standing would be seen as having his back toward the man bending over—a distortion which obviously removes the implication of anal pre-occupations.

RESULTS

TABLE II

Group Mean Correct and Error Scores at Each Grade of Illumination

Grade	Neutral Controls +	Neutral Controls −	Parent-Child +	Parent-Child −	Sexual +	Sexual −
1	5·7	·11	4·8	·05	3·7	·48
2	8·6	0	5·1	·22	5·8	·14
3	10·0	0	5·8	·22	6·7	·14
4	11·0	0	7·2	·22	7·7	·14
5	10·5	0	6·7	·14	7·8	·23
6	10·9	0	6·7	·08	8·2	·16
7	11·3	0	6·7	·30	7·9	·13
8	12·8	0	6·7	0	7·5	·41
9	12·5	0	12·0	0	10·3	·16
10	12·5	0	12·2	0	9·0	1·16

TABLE III

Mean Correct and Error Perceptions of the Three Groups of Sentences

9 Sexual Deviants	Mean Correct Score	Mean Error Score
Neutral Controls	10·58	·01
Parent-Child	7·39	·12
Sexual	7·46	·31

3 Normal Controls*	Mean Correct Score	Mean Error Score
Neutral Controls	10·72	·05
Parent-Child	8·57	·09
Sexual	8·31	·11

* Correct mean scores for P/C and sexual sentences significantly different from neutral but not between themselves. No significant difference established between neutral and P/C mean error scores for the psychiatric and normal controls. The psychiatric group score significantly higher on sexual errors than normal controls.

TABLE IV

(a) *Analysis of Variance of the Correct Scores to the Three Groups of Sentences*

Variance Ratio between and within groups = 7·3 (P=<·01).
C.R. between Neutral and P/C sentence = 5·06 (P=<·01).
C.R. between Neutral and Sexual sentences =11·55 (P=<·01).
C.R. between P/C and Sexual sentences = ·007 (not significant).

(b) *Analysis of Variance of the Error Scores to the Three Groups of Sentences*

Variance Ratio between and within groups = 4·8 (significant beyond ·05 level, but not ·01 level).
C.R. between Neutral and P/C sentences =10·0 (P=<·01).
C.R. between Neutral and Sexual sentences =18·7 (P=<·01).
C.R. between P/C and Sexual sentences = 1·9 (P=borderline ·05 level).

DISCUSSION

(*a*) PRESENT RESULTS

The findings are consistent with the prediction that as a group the neutral sentences would be reported earlier and with fewer errors and distortions than the affectively loaded sentences. The results for the correct (+) and error (—) scores of the neutral, parent-child and sexual sentences are given in Table II. There is an almost complete absence of errors for the neutral sentences, whereas the parent-child and sexual sentences show differences which reach a high level of statistical significance. The sexual sentences show considerably more errors than do the parent-child ones. In the latter no errors were recorded after the 7th grade of illumination, whereas the sexual sentences showed, in fact, a large increase after them. In this respect the mean error score at the highest level of illumination is particularly striking. Neutral and parent-child sentences for the correct scores show a much more even increase with the progressively higher level of illumination than do the sexual sentences.

It is interesting to note some of the patients' responses to the sexual and parent-child sentences. For each response quoted, no errors were incurred by the particular subject to the neutral sentences at the equivalent grade of illumination.

Sexual Sentences (*See Table I*)

Response

1. "Very large number of people are guilty of . . . sex."
1. "Very large number of people are guilty of . . . sexual conduct."
2. "They wish they were not gathered together . . . ."
2. "Many wish they were not bothered by thoughts about . . . matters."
2. "Wish brought up . . . matter."
2. "Wish they were not together."
2. "Many wish they were not bothered by people."
2. "Many wish they were not bothered by thoughts."
3. "A man and a woman usually thinks . . . sex."
3. "Man usually thinks sexually."

Parent-Child Sentences

4. "Parents who treat young children like grown-ups."
4. "Parent treat son like grown-up."
4. "Many parents treat children like grown-up sons."
5. "Parents-People more at fault than children."

In line with a decrease of intensity is the omission of "very bad" in sentence No. 1 (sexual) for two subjects; the omission of "sex and related" in two responses to sentence No. 2 (sexual); the omission of "is with a woman" in sentence No. 3 (sexual) and the substitution of "when a man is with a woman *he*", by, "a man *and a* woman usually thinks".

There appears to be considerable "projective content" in the parent-child sentences in the direction of the expression of attitudes. This suggestion was not investigated to the extent of establishing its validity.

It will be noticed from Table IV that there is a significant difference between the report of correct words both for the parent-child and sexual sentences as compared with the neutral ones. Similar to the findings of the previous paper (Walton, 1954), it is not possible to utilize these results since the correct score mean for the sexual sentences is not clearly differentiated from the parent-child one (t= ·007, not significant). The same occurred in the three normal subjects. The error scores occur significantly more often to the sexual sentences than to the parent-child ones. The value of t between the two group mean error scores is 1·9 (significant borderline ·05 level). As such this group of sexually disturbed subjects shows a tendency to record perceptual errors and distortions significantly more often to the sexual sentences than to the parent-child and neutral sentences. This difference does not hold for the correct means. These findings are consistent with the work of Schafer and Murphy (1943), Postman and Bruner (1948), Eriksen (1951) and Rosenstock (1951), all of whom came to the conclusion that threat tends to disrupt both accuracy and speed of perceptual report. It is in the interpretation of the causes of this disruption that disagreement is the greatest. It is nevertheless interesting to compare the present results with those from the previous paper. It will be remembered that whilst the correct scores for the parent-child sentences (sentences which referred to the later established area of greatest disturbance) were not clearly differentiated from the others, perceptual errors to these same sentences reached a high level of statistical reliability when compared with the neutral. This is important because it seems to indicate two things. One, that sexual material is not necessarily the only material to produce distortion. Secondly, the results of the two studies appear to show some agreement in that sentences which refer to either the basic source of difficulty or to the subject's presenting symptoms, show a tendency towards somewhat similar responses, i.e. errors and distortions.

The poor perception and distortion of the affective sentences do not appear, however, to be invariable amongst the present sample. Of the nine subjects, four showed distortion throughout all levels of illumination, three showed varying degrees of distortion but always ending by the fourth or fifth level and finally two subjects showed no distortion. Thus seven out of the nine cases show perceptual errors in accordance with their presenting symptoms. Of the four who "distorted" all the time for the sexual sentences, none showed distortion on the neutral sentences. Similarly the two subjects who showed no distortion to the sexual sentences showed no distortion to the neutral ones. Seven subjects showed no distortion, at any time, of the neutral sentences. The remaining two showed none after the first grade of illumination.

Whilst both these studies carried out by the writer suggest that perceptual errors occur significantly more often to relevant disturbing emotional content and that whilst there appears somewhat relative agreement that emotional content results in raised thresholds, distortion and fewer experimental responses reported to such material, this is not to suggest that this relationship is an invariable one. Explanations advanced to account for these differences are indeed many.

The failure to record a consistent relationship between the incidence of perceptual error and either presenting symptoms or basic source of difficulty might at first sight appear to decrease the range and applicability of this diagnostic approach. Nevertheless examination of the different conditions which might affect performance suggests its usefulness in terms of prognosis and the assessment of the degree and course of illness. Further, it is by the establishment of the conditions under which "distortion" does or does not occur both in normal and abnormal subjects that we may tentatively lead ourselves to understand better that which suggests itself as a basic facet of human behaviour—that of seeking psychological equilibrium. By the establishment of such laws we would be able to set ourselves the task of establishing the basic factors behind this need for equilibrium. A synthesis and re-valuation of recent experimental work on perception seems therefore the first thing to be done.

(*b*) REVIEW OF RELEVANT LITERATURE

Whilst the present study has been seeking to relate "perceptual errors" to basic sources of disturbance and presenting symptoms with a view to the development of a valid diagnostic test, it appears that this relationship, although high, is not an invariable one. To seek an explanation for these differences it is necessary to enquire into studies whose aim has been the investigation of the different conditions which affect perception or the basic determinants behind what we see. Thus by linking the two approaches it seems possible that the incidence of "distortion and error" may be explained under one or more headings which can be verified under rigidly controlled experimental conditions, just as can the similar explanations behind the absence of perceptual errors. Without this synthesis and re-valuation little advance will be made since many will interpret the perceptual phenomenon in terms of their own accepted yet still unproven theories. The following have been suggested by different experimentalists to account for perceptual changes, some in relation to perceptual defence, others in relation to more general perceptual phenomena.

(1) *The Delay in the Report and the Distortion of Emotionally Charged Words and Sentences Can be Explained in Terms of Perceptual Defence*

Positive support for perceptual defence has been given by Eriksen (1951, 1952, 1954), Lazarus (1954), Blum (1954a, b) and McGinnies (1949). The work of Eriksen seems of particular relevance in suggesting one reason why two of the present sample failed to respond with distortions and errors. Amongst the 45 white male psychiatric patients he used there were nine on whom pertinent behavioural data were available. Six of these showed definite evidence of a very strong aggressive need that was freely and openly expressed in consciousness and overt physical behaviour. They had a history of frequent arrests for fighting, assault and murderous intent, etc. The other three patients had histories of frequent overt homosexual experiences prior to hospitalization.

His experimental technique consisted of the tachistoscopic presentation of scenes showing people in the act of expressing or gratifying different needs. The eight needs chosen were those considered by Murray (1938) to be the most frequently latent or repressed in individuals (e.g. aggression, succorance, homosexuality, etc.). He found that five of the aggressive subjects had recognition thresholds for the two aggressive scenes that were lower than their mean recognition threshold for the ten neutral scenes. In the case of the sixth subject the threshold for the aggressive scenes was only slightly higher than the threshold for the neutral ones. He also found that there was a significant correlation between the disturbance scores on a word association test and the degree of perceptual threshold elevation for the corresponding need scenes. He concluded that, "*. . . these results present strong evidence that perceptual defence does occur for stimuli associated with unacceptable needs . . . and that the overtness is the expression of . . . respective needs by the nine patients suggests that the needs would not be defended against in perception*".

Similar findings to these are reported by Bitterman *et al.* (1953). From a sample of 348 undergraduate women at the University of Texas to whom the complete Minnesota Personality Inventory (1951) had been administered, 40 subjects were chosen. Twenty had low anxiety scores on Taylor's Scale of Manifest Anxiety (Taylor, 1951, 1953) while 20 others had high anxiety scores. Tachistoscopic recognition thresholds were obtained from two neutral practice words, four taboo words and four neutral control words. The results showed no relation between anxiety level and perceptual threshold. There was, however, a significant correlation between the Psychopathic deviate score and the size of the residual difference between taboo and neutral words. The Psychopathic deviate scale was selected as a measure of non-conformity, so as to test the hypothesis that the observed differences were a function of readiness to report. Their conclusions were that *the differences between neutral and taboo words* (*beyond those attributable to frequency of experience*) *could be understood in terms of differential readiness to report.*

Excerpts from some of the reports of subjects asked to report on the experiment are both relevant and revealing—"I hesitated to report the first one because I didn't expect to be shown that type of word"; "I saw the first one, I know, a few times before I reported it"; "I wanted to be sure I saw every letter of those words before I called them"; "I saw Kotex but I kept telling myself it can't be that"; "The first word was a surprise, and I hesitated to call what it looked like"; "I definitely saw the words but thought 'Oh no, it couldn't be that' and kept trying to see something else"; "I identified *raped* at the very first but hesitated to say it".

(2) *The Delay in the Report and the Distortion of Emotionally-charged Words and Sentences Can be Explained in Terms of* "*. . . Factors . . . Within the Individual Which Prevent the Appearance in Consciousness of Certain Kinds of Material . . .*" (*Rosenstock, 1951*)

The work of Rosenstock and others would appear to suggest an unconscious repression of certain kinds of emotional material. This has been more fully developed in the introduction to the present paper. He noted, for example, that women found it more difficult to report seeing primarily aggressive sentences. On the other hand men found it more difficult to report sentences which were primarily sexual in nature. These differences were very clear-cut. Rosenstock developed this to favour the existence of repression—". . . explanations for these findings can be advanced which are consonant with and predictable from psycho-analytic theory". Work with a similar orientation has been carried out by McGinnies (1949) and Lazarus and McCleary (1949, 1951). McGinnies put forward the controversial viewpoint that there existed *an autonomic discrimination of threat before perceptual report.* McCleary and Lazarus (1949) and Lazarus and McCleary (1951) attempted to control the factors of word frequency and inhibition of report of threatening words. They found a higher pre-recognition Galvanic Skin response deflection for shocked rather than non-shocked nonsense syllables. They also concluded that the autonomic responses indicated that a discrimination was occurring before conscious recognition. They referred to this process as "subception". In their study they attempted to minimize the danger of consciously withholding reports by the use of nonsense syllables rather than taboo and other meaningful emotional material. They noted that subjects gave a significant Galvanic-Skin response to the nonsense syllables which had been connected with shock. Since some subjects did not report the stimulus correctly yet gave a significant G.S.R. to those syllables associated with shock led them to conclude that "subception" or the process of *autonomic discrimination without awareness was occurring.*

(3) *Postman Has Suggested an* "*Hypothesis Theory*" *to Account for Perceptual Defence Data*

Postman (1953a, 1953b) later came to the conclusion that the concept of "perceptual defence" was an expendable one and argued that whilst perceptual defence was an undoubted property of certain recognition thresholds it was possible to consider certain mechanisms as mediating it. He defined a hypothesis as, "A predisposition of the perceiver to organize stimulus cues in specific ways . . . hypotheses vary in strength, i.e. they vary in the amount of stimulation necessary to arouse, confirm or deny them . . . perceptual defence . . . can now be economically conceptualized in terms of interference among competing hypotheses". He concluded that perceptual defence resulted from the dominance of strong alternative hypotheses, "rather than the active repression of the inimical or dangerous". The result of this is, "In the presence of partial information, strong hypotheses incompatible with the threatening stimulus may be evoked . . . if this is the case, the subject will appear to be defending himself against perception . . . If, however, hypotheses related to the negative stimuli are strong, the opposite of defence will appear to operate." For further discussion of the "hypothesis theory" the reader is referred to Bruner (1951).

(4) *Gestalt Psychologists Have Considered the Perceptual Data to be Explainable in Terms of the Gestalt Laws of Perceptual Organization*

The main references are those of Hochberg *et al.* (1949) and Luchins (1950, 1951). The Gestalt Psychologist sees perceptual organization as determined by autochthonous factors derived from the nature of the physical stimuli and the neural effects which they cause in the nervous system. The autochthonous determinants of perception, "reflect directly the characteristic electrochemical properties of sensory end organs and nervous tissue". Although the Gestalt Psychologist does not deny the importance of the effects of motivation, need and mental set on perception he emphasizes that sensory factors are of prime importance in accounting for perceptual organization.

(5) *The Delay in the Report and the Distortion of Emotionally-charged Words and Sentences Can be Explained in Terms of Suppression of Taboo Material*

Both Lysak (1954) and Murdoch (1954) have considered this interpretation. Lysak, using 144 students from undergraduate courses at the University of Wisconsin, found that his subjects avoided shock syllables and chose the nonshocked ones. Under different experimental conditions, punishment in the form of electric shock was thus responsible for directing behaviour and perception in the direction of raised visual recognition and lowered thresholds. He agreed that something very similar probably went on in McGinnies' experiment and that his experimental set-up was a punishing one—"the forcing of naïve subjects to report words like *bitch* and *whore*—and not merely a threatening one is suggested by the failure to obtain the same results when impending shock is merely a faint threat and not an actuality". Lysak quotes the work of Lacey *et al.* (1953) as supporting this point. They found that the more incomplete the subject's expectations were about the nature of the words they were going to see, the greater was the difference between their taboo and neutral words. It appeared that when the subjects were informed of what was going to happen they had less reason to suppress their responses. As Lysak says, ". . . the psychological climate is structured for them and the reporting of taboo words is made much less painful . . .". Postman, Bronson and Gropper also report data which indicate that relative thresholds for neutral and emotional words vary significantly with the preliminary instructions given to subjects. An uninformed group had higher alternative thresholds for taboo words than any of the groups favoured to expect taboo words. These authors conclude that, "set and selective verbal report contribute to the observed threshold differences. Response suppression is a form of selective verbal report."

(6) *The Perceptual Content is Determined by the Mental Set of the Subject*

Howes *et al.* (1950) have suggested that perceptual defence could represent a tendency on the part of the subject to withhold verbal report in a selective manner in a "difficult" experimental situation. As Freeman (1954) says, quoting the work of Postman *et al.* (1949), "The subject's predominant set may predispose him to try some alternative hypotheses, not the correct one, which necessarily results in an increased recognition threshold. In a situation in which the number of alternative hypotheses is reduced, e.g. by an appropriate set to expect emotionally toned material, the perceptual-defence phenomenon should be virtually eliminated."

Freeman's aim was to determine the effect of set, created by different sets of instructions, upon the perceptual defence phenomenon. He used 88 male students from the introductory psychology classes at Northwestern University and found that when the subject is set to expect taboo material perceptual defence does not occur. Where the subject is set to expect taboo words a "sensitization" of these words occurs, similarly, when the subjects were not set to expect taboo words, a "habituation effect" to successive taboo words occurred.

Howie (1949) has attacked the earlier formulations of Bruner *et al.* (1947, 1949a, 1949b) and Postman *et al.* (1948), especially when they formulated perceptual defence as a basic axiom—"Given a stimulus impact of a certain character, perceptual process operates to maximize current needs and expectations and to minimize percepts inimical to such needs and expectations". He agrees with Luchins (1950) that what has previously called for interpretation in terms of defence could be understood more simply in terms of set. In a later paper (Howie, 1952), he severely attacked the concept of "perceptual defence" operationally, logically and metaphysically. Following closely on Howie's paper, Postman (1953) agreed with Howie's conclusion that the facts could be subsumed under the general principles of perception. He believed Howie was right for the wrong reasons. Postman (1951), Postman *et al.* (1951, 1953*b*) are of relevance.

(7) *The Results Previously Described as Determined by Perceptual Defence Can be Explained in Terms of a Word Familiarity Interpretation*

The main exponents of this viewpoint have been Solomon *et al.* (1951), Postman *et al.* (1953) and Howes (1954). Postman *et al.* (1953) for example, hold the view that the differential frequency of usage of emotional and neutral words accounts for the perceptual selectivity found in experiments on perceptual defence.

(8) *The Presence or Absence of Perceptual Defence has been Interpreted in Terms of "Ego-strength, Adjustment and Defence-structure"*

Kurland (1954) investigated the specificity and generality of defence-mechanisms. He used 22 hospitalized patients with obsessive compulsive mechanisms, 15 with hysterical mechanisms and 21 normal subjects. All the subjects were presented with neutral and emotional words which had been recorded on a magnetic tape. There were increasing degrees of loadness so as to enable the experimenter to obtain the recognition thresholds. Kurland found no difference in perceptual thresholds for the two groups of patients. The two groups combined perceived the emotionally loaded words at lower thresholds than did the normal subjects. His conclusion was that there was a lack of generality in defence-mechanisms and that, "further study is necessary before we can accept with confidence the assertion that a subject will respond to anxiety in a perceptual situation with the same type of defence that he employs in a non-perceptual situation".

These results are supported by Goldstein (1952) and Belmont *et al.* (1951). Goldstein in a study of the constancy of defence mechanisms in normal subjects came to the conclusion that whilst generality does apply to a small group of subjects there are considerably more who use different defence mechanisms, in relation to different impulses. Similarly Belmont *et al.* (1951) found no constancy in the subjects' use of repression in learning, recall and re-learning of nonsense syllables, some of which were associated with shock.

Results somewhat contrary to these have been returned by Eriksen (1952). He found that subjects who remembered their successes returned higher recognition thresholds with a slower learning for words on which they gave evidence of blockage in the word association test used. This contrasted markedly with those subjects who showed a good recall of failure. This group showed no retardation of learning and manifested approximately the same recognition thresholds for words on which they blocked as those on which no blockage occurred. Lazarus and Longo (1953) similarly found that when subjects remembered their failures in one experiment, they recalled in another experiment predominantly nonsense syllables previously associated with electric shock. Those subjects who previously recalled mainly successful experiences subsequently avoided the electric shock by remembering mainly the non-shocked syllables.

Lazarus, Eriksen and Fonda used two neurotic groups—one using intellectualizing defences (obsessive-compulsive) or repressing defences (conversion hysterics). They listened to a tape recording of a number of sentences, some sexual, some aggressive and some essentially neutral in content. There was a masking noise to make correct perception more difficult. The conversion hysterics made more accurate perception of the neutral than either the sexual or aggressive sentences. The compulsive-obsessive heard both kinds of emotional material better than the neutral. Similar to this is the work of Kleinman (1954) who on the basis of defence-structure was able to predict the consequences in perceptual behaviour. The work supported that of Lazarus *et al.* Two groups, one of subjects suffering from psychogenic hearing impairments, the other with cases of organically produced hearing impairments. Both groups were tested for auditory perceptual recognition thresholds for a series of non-affective words. These words were then included in a playlet which contained a theme which was considered basic to the psychogenic deafness syndrome (i.e. conflict with authority, resulting in anxiety and defendency). The playlet was then given to the two groups. The perceptual recognition thresholds for the original words were then taken. The organic group showed an improvement reflected in a marked reduction of thresholds. The same degree of improvement did not occur in the psychogenic group.

Alper (1946) found that those individuals who were described on the basis of clinical judgment as having "strong egos" showed a tendency to favour uncompleted tasks in recall under "task-oriented conditions" whilst under situations which represented a threat to self-esteem they recalled completed tasks. On the other hand those subjects who had "weak egos" showed the opposite. They tended to recall their completed tasks under "task-oriented conditions" and the uncompleted tasks when their self-esteem was threatened by the experimental set-up. Eriksen (1954) draws the following implications from these results, ". . . weak egos are threatened by the objective, non-threatening, task oriented condition and bolster self-esteem by recalling successes. However, when the threat becomes objectively more severe they are overwhelmed by their inadequacy and recall their failures. Strong egos, on the other hand are less easily threatened, and when threat does occur they cope with it by emphasizing successes rather than being overwhelmed by their inadequacy."

Others rather than interpret these findings in terms of "ego-strength" have done so in terms of defensive processes. Glixman (1949) and Rosenzweig (1943) have compared differential recall with the defensive mechanism of repression. Rosenzweig and Sarason (1942) found that the tendency to recall completed tasks when self-esteem is threatened is correlated with hysteria. This appears correlated with the results of Eriksen (1954).

In his study of "Ego-strength", Eriksen (1954) found that it was related to the tendency to recall more often the uncompleted rather than completed tasks when the experimental situation was not "objectively self-esteem threatening" whereas when it was, the opposite obtained. Scores on the hysteria scale (M.M.P.I.) were inversely related to the tendency to recall more incompleted rather than completed tasks when the situation was "objectively self-esteem threatening". Relating these results to the work of Eysenck (1947) Eriksen says, "Eysenck reports that in level of aspiration experiments subjects high on the extraversive pole tend to overestimate their performances and are little bothered by failure, while subjects falling on the introversive pole tend to underestimate their performance and are preoccupied with their failures. Such reaction to failure and threat would, at least superficially, seem to be related to differential memory for completed and uncompleted tasks. By emphasizing the successful tasks and ignoring the failed ones, extraverted subjects would be expected to recall more completed than uncompleted tasks, while for the intraversive subjects this tendency would be reversed." He very rightly goes on to stress, "The relation of the present data to Eysenck's findings suggest some interesting possibilities and avenues for further research, but it must be stressed that these relationships have not been proven. There is still much to be desired, not only in identifying the present data with the neuroticism and extraversion-intraversion factors, but also in clarifying and substantiating the relationships obtained in the present study."

(9) *The Speed and Content of the Perceptual Report of Emotional Material is Partly Determined by the Needs and Mood of the Individual*

Both the work of Levine, Chein and Murphy (1942) and Bruner and Goodman (1947) have shown that the perception of ambiguous objects is related to the hunger needs of the subjects and the perceived size of coins was determined by the "differential goal character" of the coins for the poor and rich children. Sanford (1936, 1937) has shown that the need for food has a significant effect upon word association, the interpretation of "neutral pictures" (pictures having nothing to do with eating of food), completion of drawings or the completion of words where only the first two letters of the word are given. The interestingly relevant finding was that the direction of distortion was partly determined by need. For example, a picture of a baby with its fingers extended was interpreted to mean, "He's sticking his fingers in the pie", by some members of the hungry group, while other members from the non-hungry group interpreted it as, "He's pointing to a toy".

(10) *Perceptual Distortion May Result from the Presentation of Disturbing Material to Which the Subject is Forced to Give Responses, the Resulting Frustration Building Up Tension*

"The frustration of goal achievement and the failure of tension reduction may lead to a variety of adaptive or maladaptive behaviour" (Krech and Crutchfield, 1948). They stress that no matter how "bizarre" or "irreal" the resulting behaviour may be it can always be understood in terms of reduction of need tension. Whether need tension results in "maladaptive practices" depends on ". . . the strength of the need tension, the individuals' characteristic manner of responding to frustration, and the perception of the block to the goal".

Birch (1945) studied the influence of different degrees of food deprivation on the problem-solving ability of chimpanzees. The solution demanded the perception of the relationships between crossed strings and food attached to some of the strings. Success depended on different solutions such as the use of sticks to rake in the food, etc. The six chimpanzees were deprived of food for different times, 2, 6, 12, 24, 36 and 48 hours. The experimental results indicated that excessive tension caused by significant food deprivation interfered with the problem-solving ability so as to interfere seriously with the problem-solving efficiency—". . . Under conditions of very intense motivation, the animals concentrated upon the goal to the relative exclusion of other features of the situation which were essential to the solution of the problem. Also, the frequent recurrences of frustration responses, such as tantrums and screaming . . . hindered the animals in their problem-solving efforts" (Birch, 1945).

Dembo (1931) using human subjects carried out an important experiment. The subjects were asked to stand in a marked square from which they were not allowed to move. The experimental task was for the subject to reach a flower which was four feet from the marked square. There were only two ways of reaching the flower but the subjects were told that there were three. When they had tried the two possible methods the subjects were in a frustrating situation and when the experimenter insisted that there was a third method the tension increased greatly. Anger, very bizarre perceptions and distortions resulted. One subject reported "seeing the room filled with water, and the flower floating towards her". Rings, which had been placed near the square, were picked up and used many times, although plainly of little value in helping the subject.

(*c*) Re-formulation to Account for Present Perceptual Changes

Altogether some ten explanations have been advanced to account for the perceptual errors noted in the present investigation. Closer examination of these alternatives suggests, however, that there is considerable overlap and that the results can be subsumed under fewer headings. One thing does, however, appear certain. Personality dynamics do influence even relatively simple perceptual acts and the different conditions which produce these changes can be detected by controlled experimentation.

The first suggested explanation of the perceptual changes was that they resulted because of a perceptual defence process. The work of Eriksen, in particular, suggested that the delay in the report and the distortion of emotionally charged sentences would be greatest when the stimuli were unacceptable to the subject. Bitterman *et al.* (1953) contributed to a better understanding of this problem with results which suggested that the differences between neutral and taboo words could best be understood in terms of a *conscious differential readiness to report.* The psychiatrists in charge of the nine cases were therefore asked to assess the presence or absence of guilt at the time of the experiment.*

These results would suggest that patients in whom there existed no superficial need for "defence" in any particular area, though their behaviour may well be maladaptive, would be less likely to manifest hesitancy, perceptual defence and distortion, whereas those in whom there existed a need to defend against unacceptable stimuli would be more likely to respond in this way. The concept of guilt or the evaluation of self in relation to the laws of society seem therefore of importance. The hesitancy seems to suggest itself as being under the conscious control of the individual.

Both this conclusion and experimental trends appear at variance with Rosenstock's interpretations. It will be remembered that he was attempting to validate the psycho-analytic conception of repression. His work and that of others would not appear to suggest an unconscious repression of material, but as an alternative rather to suggest a conscious hesitation to report certain kinds of material. Rosenstock makes the point that the differences noted between men and women in their response to aggressive and sexual sentences were so clear-cut as to favour the existence of repression. Although one would agree that Freud (1933) has argued that in boys the Oedipus Complex is based on sexual attitudes and that it is repressed because of castration anxiety with the resulting formation of a strong super-ego, this is not to deny the possibility that avoidance of socially unacceptable material alternatively may not be beyond the conscious control of the individual. Similarly in girls Freud has argued that castration-anxiety or penis envy prepares the way for the Oedipus Complex and that its incidence is accompanied by the outbreak of pent-up hostility towards the mother. Since there is an absence of repression of sexuality the development of the super-ego suffers. This is again, however, not to deny the possibility that due to cultural and constitutional factors the girl is forced to give up her aggressive attitudes and assume a relatively passive role. As Rosenstock says, ". . . ordinary conventions prohibit her from manifesting hostile impulses". One can therefore perhaps look for a partial explanation in terms of a conscious "differential readiness to report" for which there is some experimental evidence, rather than seek explanations in terms of still unproven theory.

The work of McGinnies (1949), McCleary and Lazarus (1949) and Lazarus and McCleary (1951) which appeared to support the investigation of Rosenstock can be criticized on several counts. Solomon and Howes (1950) and Howes and Solomon (1951) failed to agree with the work of McGinnies in that there was a possible intervention of a conscious inhibition between the initial perception and report of perception. Thus, they argued, the perceptual thresholds for taboo words would be raised not because of an unconscious defence process, but rather because of a conscious withholding of the report. Their second objection was that the results may be accounted for by the fact that the selected neutral words, generally being more common ones, were more rapidly seen as a function of the subject's greater acquaintance with them. Similarly the conclusion of Lazarus and McCleary that there was a process of "subception" was reached without adequate experimental verification. Brickner and Chapanis (1953), as previously noted, have shown that when syllables are perceived incorrectly some information is conveyed to the subject such that he may be able to establish from which class of stimuli the particular stimulus comes, even though an incorrect verbal report is given. They suggest that the recognizable elements amongst the syllables used by Lazarus and McCleary may account for the G.S.R. effects which were obtained.

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* Of the nine patients, four showed distortion throughout all levels of illumination. Three of these patients were reported to have guilt feelings at the time of the experiment, whilst the fourth (inability to micturate in public) is reported to have suffered more from self consciousness than guilt. Three patients showed distortion which always ended by the fourth or fifth level of illumination. Two of these were reported to feel guilty, the third was not. Two patients showed no distortion. Neither of these, clinically, showed evidence of guilt over their offences.

Cowen and Beier (1950) and Beier and Cowen (1953) used a threat-expectancy situation so as to try to reduce the possibility of inhibition of report. They demonstrated that subjects tended to require a large number of trials and more time for the correct report of threat words than neutral ones. In their third paper (Cowen and Beier, 1954) they tried to determine whether the delayed report of threatening words occurred under conditions of threat-expectancy in an experimental set-up which allowed them to determine the operation of possible conscious inhibition as well as differential word frequencies. Significantly more trials were required for the correct report of threat words compared with neutral ones. In addition no correlation was found between the number of trials required for the test words and word frequency. They carried out several checks to study the possible influence of conscious inhibition on the above findings. They agreed that since their relatively sophisticated experimental group (59 College undergraduates), on post-experimental enquiry, admitted few instances of deliberate inhibition, then the results were less likely to be explained on the basis of conscious inhibition but rather due to the probable operation of a perceptual defence process. This is a surprising conclusion since the advocates of perceptual defence never considered a defensive system existing apart from that directed by an individual. They certainly did not consider a defensive system existing within the perceptual process itself. Apart from these more obvious objections there is the one that can be inferred from the results of Bitterman *et al.* (1953). They used, it will be remembered, a group of 348 undergraduate women at the University of Texas, a presumably "sophisticated experimental group", yet the results show quite clearly a conscious differential readiness to report taboo words.

These studies would lead one to suggest that much of the work on perception which is at present interpreted in terms of the unconscious and related fields, can more readily and easily be interpreted in terms of a "differential conscious readiness to report".

Not many people would agree with the "exclusive" interpretation of perceptual organization in terms of the Gestalt laws. A major criticism against the Gestalt school is that they too frequently neglect to consider that the principle of perceptual organization may involve two major categories—those relating to the structural factors of perception and those relating to the *functional* factors. Often the Gestalt school neglects the findings from many well-known experiments. To quote but a few dealing with the effects of functional factors in perceptual organization—Bruner *et al.* (1947) studied two groups of children. One group came from a very poor slum area, the other was a rich group from the prosperous business and professional families in the same city. Both groups were asked to judge the size of various coins. The poor group overestimated the size of the coins considerably more than the rich children. Levine *et al.* (1942) presented ambiguous drawings behind a ground-glass screen to hungry college students. They were seen more often as food than when presented to college students who had just finished eating. This cannot be considered due to structural factors since the same pictures were presented to both groups. For an elaboration on this point the reader is referred to Krech and Crutchfield (1948).

Whilst the conclusions reached from experimental work on "suppression of taboo material" and the effect of "mental set" as partial or possible explanations of perceptual changes appear justifiable, when results are explained in terms of a word familiarity interpretation more doubt exists. Lazarus (1954) has criticized this approach and maintains that there are serious flaws in the arguments of its main protagonists and that they ignored a number of relevant studies. Correlations between word frequencies and visual recognition thresholds are minimal and most of the covariance occurs when words of minimal frequency were compared with words of slightly greater frequency. In support he quotes the data reported by Howes *et al.* (1951) and Solomon *et al.* (1952). In fact it appears that little covariance occurs when highly frequent words of different frequency value are used. He adds that these are the types of words usually used in perceptual studies.

Attempts to relate the presence and extent of perceptual defence to "ego" strength, adjustment and defence-structure seem to hold considerable promise, especially since the work of Chodorkoff (1954) provided a certain confirmation of trends deduced from previous experiments. He attempted to investigate the relationship between personal adjustment and perceptual defence. In general his hypothesis was supported inasmuch as perceptual defence shows a tendency to increase with a decrease in adjustment. If one can perhaps relate this work to that of Eriksen (1952a, b, 1954a, b), Alper (1946), Eysenck (1947), Glixman (1949), Lazarus and Longo (1953), Kleinman (1954), Rosenzweig and Sarason (1942) and Rosenzweig (1943), the suggested conclusion would be that those subjects who, as a group, manifested satisfactory adjustment would be less likely to manifest perceptual errors than the group characterized by poor adjustment. In addition, however, although experimental conditions of threat to self-esteem appear important to all, it is suggested that the group composed of maladjusted individuals, would react to conditions of threat to self-esteem in two different ways—one which would show little or no perceptual distortion, the other which would show a great deal of reaction to the same perceptual stimuli. The factors of over and under socialization and their possible inclusion within the framework of anxiety-dysthymia and hysterico-psychopathic disorders respectively (Eysenck, 1955) appear of relevance to a further understanding of this problem.

Preoccupation with the satisfaction of certain needs might lead to perceptual errors and distortion of sentences in line with these preoccupations. It will be remembered that Sanford (1936, 1937) showed that the need for food had a significant effect upon the interpretation of neutral pictures. The example was quoted of several hungry children interpreting a picture of a baby with its fingers extended as, "He's sticking his fingers in the pie". Similarly some of the recorded errors in the present investigation can be interpreted along the same lines. This point has already been mentioned in "Analysis of Data"—"Projective Errors". Examples were given of the response of two homosexuals to the sentence, "When a man is with a woman he usually thinks of sexual things". The distortions appear to be in accord with the needs or attitudes of the subjects.

The final point emerging from a consideration of the work of such as Krech and Crutchfield (1948), Birch (1945) and Dembo (1931) is that when emotional sentences are projected on a screen for ten exposures, this represents an increasingly difficult situation such that tension builds up with the result that perceptual distortion occurs, independently of that dictated by "defensive intentions" on the part of the subject.

From a consideration of the above alternatives, five explanations suggest themselves as being either of much greater import or supported by adequate experimental work. These alternatives can readily be subjected to experimental verification. Whilst the following are noted separately, this is in no way to imply independence of function.

(1) When perceptual stimuli are "unacceptable" the person may respond by trying to reduce the threat. The subject's own evaluation of the experimenter's attitude towards him in relation to the rapid report of either "socially taboo material" or material referring to adverse or difficult aspects of the patients' previous behaviour, appears of relevance. All in all when the situation is self-esteem threatening the subject may respond by distorting the perceptual stimuli in such a way as to reduce the threat to self. It is suggested that the response to such material is under the conscious control of the individual. When the perceptual stimuli refer to needs which are overtly and openly expressed distortion tends not to occur.

(2) Where the psychological environment is organized by relevant instructions to expect "threat" words, etc., the situation has less "catastrophic potentiality", the threat to self-esteem is lessened and there is less likelihood of defensive behaviour in relation to the threatening stimuli.

(3) It is suggested that a relationship exists between adjustment and a relative absence of perceptual error, just as those who show evidence of maladjustment are more likely when presented with disturbing perceptual material to record a proportionately greater increase in perceptual error. It is also suggested that there are some who can be deemed "maladjusted" yet will not show perceptual errors. The incidence of the latter seems to be dependent on the interaction between defence-structure, self-esteem and the "unacceptable" nature of such material. The work of Eriksen, in particular, appears to suggest that the response of those on the extravert dimension (hysterics and psychopaths) is likely to be quite different to a self-esteem threatening situation than by those on the introversive one (anxiety states, depressive states, and obsessional neuroses).

(4) Where the "need" or "mood" of an individual is strong, it is likely that perceptual errors will occur not because of defensive behaviour, but because of a projection of these self-same needs and moods into the perceptual stimuli. This material suggests itself as being understood in the same way as material gained from projective tests.

(5) When the emotional sentences are projected over ten grades of illumination it is considered to represent an increasingly difficult situation for those subjects who see personally relevant material. With an increase in difficulty so is there an increase in tension with a resulting perceptual distortion similar perhaps to intellectual impairment noted in some severe anxiety states. It is suggested that this may occur in only a section of the so-called maladjusted group, and that the dichotomy between extraverts and introverts may serve as a useful basis for investigating this point further.

EXPERIMENT II

Problem

The initial experiment using the single case showed that perceptual errors occurred significantly more often in reaction to the report of sentences containing traumatic material. The second experiment attempted to predict that if this first observation was generally correct, then perceptual errors should occur significantly more often in other patients as a reaction to perceptual stimuli which either referred to their basic or underlying psychiatric disability or to their presenting symptoms. It was found that a group of sexually disturbed subjects did show this tendency but that it was not an invariable one. The presence of error, in this group, appeared superficially to be related to feelings of guilt whilst the absence of error was associated with an absence of guilt. From a review of the literature ten additional hypotheses were considered to account more fully for the incidence of perceptual error. It was found that these ten hypotheses could be subsumed under fewer headings. The present experiment was designed to enquire further into some of these factors and conditions which contribute to the incidence of perceptual error as suggested by the present study.

The prediction was made that the speed of report of perceptual material, relating to the field of a subject's psychiatric disability, can be made to vary according to a limited number of laws, each of which operates under the conscious control of the individual.

Material

Eighteen taboo and neutral words, controlled for familiarity and number of letters were typed on 5 inch × 3 inch white cards. The position of each word on each of these cards was identical. Control of familiarity of the words was achieved by matching the taboo words from McGinnies (1949) and the neutral words from Postman, Bronson and Grapper (1953) by means of the Thorndike-Lorge Semantic count (1944). The complete list of words appears in Table V.

TABLE V

Stimulus Words
(Taboo words are in italics)

Word	Frequency Value*
lotus	10
capon	10
Raped	13
lathe	11
Belly	47
noted	45
Whore	1
tiara	4
Kotex	4
mixer	1
terse	4
Penis	1
hilly	10
knack	13
Filth	3
clove	4
Bitch	4
Mean Taboo	10·6
Mean Neutral	10·3

* "Frequency of occurrence in 4½ million words according to the Thorndike-Lorge semantic count."

The cards were presented in a drop shutter exposure device consisting of a card holder, obscured by a heavy brass shutter. On presentation the shutter dropped exposing each card. When the shutter was fully open an electric contact point was activated and immediately a Chronotron began recording in seconds. The subject's response was spoken into a microphone, amplified, the voice key was tripped and the Chronotron stopped immediately. An exact recording of the speed of response was thus shown. There were three other cards. One was marked with a dot in the exact centre, one had a neutral word whilst the third had a taboo word marked in exactly the same position.

Subjects

The nine patients who took part in the first experiment acted as subjects for the second experiment.

Procedure and Instructions

The subject was seated in front of a tachistoscope and told that he was to be shown three cards, one to have a dot to mark the point of presentation and the remaining two to have one word on each. They were asked to say the word into the microphone as soon as they saw it. On the basis of their reaction-time to the taboo word the nine subjects were divided into three matched groups. The mean reaction times of the three groups were ·88, ·90 and ·95 of a second.

Each of the three groups was given different sets of instructions to determine the subject's readiness to report taboo words which had some relationship to their psychiatric disability. Group "one" was given the usual instructions accompanying tachistoscopic recognition procedures. The subjects in this group were not warned that taboo material would be included. The second group was given the same initial instruction with the additional information that taboo words would be included among the stimuli and further information which was designed to increase the tendency to withhold reports of taboo words. The third group received instructions designed to facilitate the report of the taboo material. The instructions were:

Group 1. "This is a test in visual perception. You are going to be presented with words by means of this instrument. They are to be shown here (present the card marked with a dot only). As soon as you recognize the word, which will appear in exactly the same place as the mark on this card, I want you to repeat it aloud into the microphone in front of you. Are you clear?"

Group 2. The same initial instructions were given as to Group 1 with the following additional remarks—"Some of the words you will see, but not all, are those not mentioned in polite society".

Group 3. The same initial instructions as to Groups 1 and 2 with the following additional remarks—"Some of the words you will see, but not all, are those not mentioned in polite society. The ability to report seeing these words quickly is often found in people of good social adjustment and maturity. Most people report that they are somewhat anxious about reporting such material".

The complete set of taboo and neutral words was given twice. On the second occasion the order of presentation was varied.

RESULTS

TABLE VI

Mean for Card 1	1st Presentation		2nd Presentation	
	Taboo	Neutral	Taboo	Neutral
Group 1: ·88	1·07	·62	1·22	·79
Group 2: ·90	·89	·61	1·20	·54
Group 3: ·95	·60	·48	·49	·33

All decimals are fractions of one second.

DISCUSSION

These results suggest that the prediction was not far from the truth. The three groups carefully matched on reaction time to a sexually taboo word show that their subsequent reaction-times to similar taboo and other neutral material is dependent on the nature of the initial instructions. When the psychological environment of the subjects in Group 1 is not structured to expect taboo material they show a slow reaction time relative to Groups 2 and 3. It is also interesting to note that the members who constitute this group had a quicker mean reaction-time to the one card prior to the experiment proper. On the second presentation of the taboo and neutral words the reaction times for this group were even slower. Where the instructions to those subjects in Group 2 give some idea of the content to be expected, the reaction times on the 1st presentation were considerably quickened. When, however, the preparatory instructions give both a warning of the content plus a facilitation to report such material (Group 3) the reaction time is very rapid. The rapid reaction-time is even more marked on the 2nd presentation. It is also noted that there is an inverse relationship between speed of reaction to the one card before the real experiment and under the three different experimental conditions.

The results, in addition to showing the influence of *mental set* on reaction-time to taboo material, suggest the importance of *conscious factors* and their relationship to self-esteem in directing the speed of response to such material as has been seen to bear a direct relationship to a subject's major area of disturbance or psychopathology. Self-esteem in this context refers to the individual's evaluation of his behaviour against a background of certain accepted rules governing sexual behaviour.

It leads one tentatively to formulate the next experimental step, that of more clearly defining the influence of guilt and its relationship with the suggested conscious differential readiness to report emotionally difficult perceptual material. The dichotomy of dysthymia and hysteria with its over- and under-socialization respectively (Eysenck, 1955) suggests itself as the framework against which to evaluate any future work on perceptual errors, provided that the perceptual content refers only to socialized drives.

SUMMARY AND CONCLUSIONS

Perceptual errors were first seen to occur as a reaction to the presentation of sentences referring directly to a basic source of difficulty. These errors did not occur to any significant degree as a reaction to either neutral sentences or sentences which were later established to refer to subsidiary difficulties.

On the basis of the results from the single case, it was predicted that if the incidence of perceptual error showed any generality at all, then other subjects would show a significant increase when the sentences refer either to a major source of difficulty or to presenting symptoms. It was with this hypothesis in mind that the second experiment was carried out using a group of sexually disturbed subjects. The results were in accord with the prediction. The mean error scores were significantly greater in number to the sexual sentences than to both the neutral and parent-child ones. The correct mean scores to the sexual sentences were not different from the remaining sentences. This finding is in agreement with the investigation using the single case. It will be remembered that although perceptual errors occurred significantly more often to the parent-child sentences, the subjects' correct responses to these same sentences did not show any significant difference to the correct scores from the remaining sentences.

The results of the tachistoscopic experiment show that the sample who record perceptual errors in the first experiment are also capable of different responses to similar sexual and taboo material according to the preliminary instructions. These findings would appear to suggest that not only is mental set and expectancy important in partially determining the subject's responses, but that the degree of hesitancy is under the conscious control of the individual, particularly when the factor of self-esteem is involved. These findings are of obvious relevance to a better understanding of the incidence of perceptual error.

Since such an encouraging start has been made it enables one to formulate more clearly future experimental trends on this subject. The first need is to establish more fully the conditions under which perceptual error does or does not occur. In this way the incidence of error can be related to one of several conditions, just as the absence of error would similarly suggest a limited number of possibilities. Once these conditions have been clearly defined and their significance fully understood then subsequent inquiry can set itself the task of controlling these conditions and noting the effects they produce either on the symptomatology or basic psychopathology.

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MEPROBAMATE IN THE TREATMENT OF TENSION STATES

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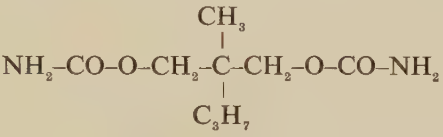
MEPROBAMATE ("Equavil"), chemically 2-methyl-2-N-propyl-1,3-propanediol bicarbamate, has the following structural formula:



$$NH_2\text{–}CO\text{–}O\text{–}CH_2\text{–}\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle C_3H_7}{|}}{C}}\text{–}CH_2\text{–}O\text{–}CO\text{–}NH_2$$

It was evolved from mephenesin, DEP (Berger and Ludwig, 1950), and myanesin (Berger and Bradley, 1946), first synthesized by Ludwig and Piech (1951), and finally established as a tranquillizer by Berger (1954). The first clinical application of meprobamate made use of its interneuronal blocking action, principally as a anticonvulsant. From 1954, meprobamate has become widely used as an ataraxic or tranquillizer.

Ever since meprobamate was marketed many investigations have been carried out to assess its efficacy in the treatment of psychotic and psychoneurotic illness. Most of these investigations dealt with such a variety of clinical pictures that it became impossible to correlate the effect of the drug with any specific syndrome. For example, one clinical trial (Selling, 1951) lists 187 cases in 16 different diagnostic groups, and another (Borrus, 1955) 104 cases in 9 such groups. Both these studies were uncontrolled, as was also a French investigation (Collomb *et al.*, 1956) where 21 neurotics and 15 frank psychotics were used. In common with the present study, it has already been pointed out (Follin *et al.*, 1956) that the hitherto published reports on clinical trials with meprobamate have employed such marked differences in classification as to make the results lack specific value.

A fairly comprehensive list of references relating to clinical trials with meprobamate was compiled and annotated by Berger (1956). His favourable conclusions regarding the efficacy of the drug coincide with the findings of Selling and of Borrus (op. cit.).

Lemere (1955) found that meprobamate offered certain advantages over other ataraxics but his investigation was also carried out without controls.

Even though West and da Fonseca's (1956) clinical trial was controlled, their results are still obscured by the multiplicity of diagnostic grouping.

It has been, therefore, the endeavour of this investigation to concentrate solely on one clinical syndrome, viz. tension states, in its therapeutic response to meprobamate.

METHODOLOGY

In recent years considerable emphasis and publicity have been given to the value of tranquillizing drugs in psychiatry. A common pattern characterizes usually the introduction of a new preparation. Remarkably favourable claims arising out of frequently uncontrolled studies appear in the medical press, only to be supplemented later by more rigorously controlled studies suggesting much more reserve and hesitancy and offering a less optimistic and more detailed appraisal of the drug. The serious discrepancies between the results of these early and of later experiments can most readily be understood in terms of the poor experimental design of the former; published research often only reports the results of the efficacy of the preparation as applied to an experimental sample, and it contains no reference to control data. These earlier publications may have an adverse and harmful effect, since lines of treatment are often based on (inadequately established) results of such studies.

As yet, no studies investigating the efficacy of tranquillizing drugs in the psychoneuroses have taken recognition of certain experimental trends. It has been shown that suggestibility is highly correlated with neuroticism, and that the degree of suggestibility tends to increase with the severity of the neurosis. Also, dysthymic patients (anxiety states, reactive depressions, and obsessional neuroses) are seen to be more suggestible than hysterics (Eysenck, 1947). Since tranquillizing drugs are extensively used for dysthymics, the factor and degree of suggestibility would appear an important if not essential variable to be taken into account in any experimental study of such drugs. The use of a control group would generally be accepted as limiting the possibility of error by gauging the degree of improvement due to heightened suggestibility. But, if the experimental group is composed of more highly suggestible patients than the control group, one may achieve success independently of the drug. Thus, whilst the administration of the drug might help the patient, the factor of suggestibility would obscure a more detailed assessment of the real value of the preparation. It would, in essence, preclude the prescribing of the drug for a particular syndrome in the absence of knowledge of the true efficacy, since either the control data or the degree of suggestibility or both were not included in the study. Alternatively, the possibility increases of wrongly recording progress as due to the drug in a patient who is highly suggestible. Finally, it limits the possibility of being able to predict the likely outcome of the treatment. Such studies, therefore, prevent other than the presumptive and optimistic application of such drugs by clinicians who tend to rely on the published reports of such investigations.

One further factor needs to be recognized concerning suggestibility. Suggestible patients become more suggestible whilst non-suggestible subjects do not change when conscious control is reduced. Nitrous oxide and sodium amytal can be used as reducing agents. Therefore, with an increase in the severity of the neurotic illness might come a less conscious control, similar to the artificial effect produced by nitrous oxide, etc. When this occurs, the likelihood of increased suggestibility must be taken into account. Since subjects for experiments with tranquillizing drugs sometimes fall into this category, one is necessarily running the risk of introducing a further error into one's investigations.

The main constructive suggestion arising from these considerations is that, whilst controlled studies limit the likelihood of errors inherent in any investigation relying only on subjective and inferential assessments, error can still further be reduced by matching the experimental and control groups in terms of the degree of suggestibility. Loose thinking in the past has considered that the inclusion of a control group will *eo ipso* give a good idea of the likely improvement resulting from suggestibility. One now needs to adopt a method of paired matching where each member of the experimental group is matched with another member of the control group in terms of suggestibility as well as in terms of such qualities as are relevant for the study. This is a painstaking and difficult task but one which cannot be avoided if an honest answer is sought to the efficacy of a new drug.

One sees, therefore, that either the experimental and control groups can be matched in terms of criteria such as suggested above, or one runs the risk of including in the sample those subjects who are less suggestible among the dysthymics and correspondingly less neurotic (probably with the best prognoses), or of including those patients who are highly suggestible and who might improve independently of the drug. There are also those subjects who resist successfully the suggestive effects of treatment; they offer a major problem in a controlled trial.

Method

The above methodological considerations led to the design of the present experiment in terms of the mentioned variables.

The test group consisted of 32 in-patients of a neuropsychiatric hospital. Sixteen patients received the drug and 16 were controls. The time available prevented the originally planned double-blind method being employed, and the patients, therefore, received either drug or placebo over a period of 4 weeks—one patient (J.M.) who left hospital after 3 weeks was included in the series. It was also felt that the possible danger of ineffective placebo response in those patients who urgently required effectual treatment was an ethical barrier to a more lengthy trial. All the patients in the series had been on varying forms of treatment, including other tranquillizing drugs, for different periods of time.

In order to make the study entirely blind, the makers of "Equanil" were requested to supply active and apparently identical placebo tablets in bottles labelled simply "A" or "B", and to provide a code in a sealed envelope, to be opened after the assessment of results or in case of a medical emergency arising during the trial. Thus, no one knew, except the manufacturers, the meaning of the code until both the experiment had been completed and the results compiled.

The tablets were administered q.i.d., each effective tablet containing 400 mg. meprobamate, and the difference in taste was disguised with quassia.

Of the 32 patients, 16 were men and 16 women. Nine men and 7 women received the drug, 7 men and 9 women the placebo. The ages varied from 19 to 57 years (mean 36·4). In the meprobamate group the subjects were aged from 29 to 56 (mean 37), in the placebo group from 19 to 57 (mean 33).

The clinical selection of the patients was made by elucidating the predominant symptoms of tension, manifested mainly by restlessness, insomnia, headaches, irritability, and panic attacks. In the initial selection the basic personality was disregarded; this important aspect of individual response to treatment will be dealt with in the discussion of the results.

Three tests were used in this study, these purporting to measure anxiety, tension, and headaches respectively. The anxiety scale was that designed by Taylor (1951 and 1953) whilst questions relating to tension and headaches were arbitrarily selected from the Minnesota Multiphasic Personality Inventory (M.M.P.I., Hathaway and McKinley, 1951). The Taylor Test of Manifest Anxiety consisted of 50, the headache scale of 11, and the tension scale of 12 questions. These 73 questions were supplemented by a further 15 questions from the M.M.P.I. lie scale, as buffer items and also to give some idea as to the reliability of the subjects' responses.

Each patient was tested 1–3 days before his trial period, and then again 1–3 days after completion of the trial. After the initial test he or she was placed in group "A" or "B".

The method of paired matching was employed. E.g., a patient who had given 38 abnormal responses to the anxiety, 9 to the headache, and 9 to the tension questions (known as 38/9/9) was matched with another subject with a similar score of 38/8/7; these two patients were assigned to group "A" and "B" respectively. Other examples were 29/7/6 matched with 29/6/6, or 25/2/4 with 25/2/9, or 20/4/6 with 21/4/6, etc.

The significance of the difference between the two means based on this method of paired matching was, t=+·386 (not significant). In this way the control and experimental groups were matched in terms of severity of symptoms, and neither group was loaded with patients who showed a better prognosis irrespective of the treatment received.

In accordance with conclusions reached on points of methodology, the two groups were also compared in respect of suggestibility and found to be closely matched; in fact, the critical ratio (t) was practically nil.

RESULTS

Clinical Assessment of Results

In computing the clinical results, the criteria adopted were (see Table I):

(a) *Basic Personality*. This was assessed clinically by ascertaining the past and present predominant personality traits. Eysenck's (op. cit.) grouping was used, and the two personality groups in this trial were headed hysterics and dysthymics respectively. The former included those patients who were hysteric or inadequate or sociopathic. The dysthymic group comprised grossly anxious, markedly obsessional, and mainly depressed patients.

The distribution of basic personality in the trial group was:
Hysterics, 13; 40·625 per cent. Dysthymics, 19; 59·375 per cent.

(b) *Suggestibility*. "Primary Suggestibility" as stipulated by Eysenck (op. cit.) was assessed by attempting light hypnosis. The hypnotic threshold was numbered S1 to 3. S1 included those patients who were hypnotizable within 2 minutes, S2 those who required 2–10 minutes to be hypnotized, and S3 those who could not be hypnotized within one 10-minute session. S1–2 and S2–3 were borderline cases.

The distribution of suggestibility in the trial group was:

S1	..11..	34·375 per cent.	Hypnotizable..22..68·75 per cent.
S1–2..	3..	9·375 per cent.	
S2	.. 6..	18·750 per cent.	
S2–3..	2..	6·25 per cent.	
S3	..10..	31·25 per cent.	Non-hypnotizable.

Five of the 20 patients in S1–S2 were hysterics (25 per cent.) whilst fifteen (75 per cent.) were dysthymics. In S2–3—S3 the position was nearly reversed; only four (one-third) of the dysthymics were difficult to hypnotize whereas

TABLE I

Basic Personality, Suggestibility, and Effect of Treatment

		Improved ++		Improved +		Improved ±		Unchanged		Deteriorated		
		Placebo	Drug	Placebo	Drug	Placebo	Drug	Placebo	Drug	Placebo	Drug	
Hysterics	S 1			AW			TH PPK					2 1 2 1 7
	S 2							HW	MBG ISM			
	S 3			MC		CR EAC	RS JD	MM MR				
Dysthymics	S 1	JS	OHG JH, LW ALD, EWP VC		KM	JC JM		DG CM				9 2 4 1 3
	S 2				JFB	JB		GF		FC		
	S 3						JW	JK	JTM			
		1	6	2	2	5	5	7	3	1		

two-thirds of the hysterics fell into this category. This tends to confirm previous findings of a significantly high positive correlation between suggestibility and anxiety, as opposed to a low positive to negative correlation between suggestibility and hysteria. The importance of this fact cannot be sufficiently stressed.

(c) *Effect of Treatment*. The scale used here was telescoped into 5 categories.

(*i*) Very marked improvement (++), including complete recovery, and good prognosis.

(*ii*) Marked improvement (+), with abatement in intensity and frequency of the main symptoms, and a fair prognosis.

(*iii*) Some minor improvement (+−), with lessened tension, and an uncertain prognosis.

(*iv*) No change in the patient's condition.

(*v*) Deterioration.

Clinical Analysis of Results

Eleven patients showed no improvement at all; 8 of these received the placebo and 3 the drug. M.B.G. and I.S.M. had extremely severe conversion symptoms, and J.T.M. was too depressed to react to any but electro-convulsive therapy.

Of the 13 hysterics in the series, only 2 improved beyond a certain point (+); both these patients received the placebo. Whereas the improvement in A.W. can be explained by her high suggestibility, M.C. who was non-suggestible, improved on the basis of gained insight through intensive and successful psychotherapy.

In the majority (11) of the hysterics, there was no appreciable degree of improvement either with meprobamate (6) or with the placebo (5).

The results in the dysthymic group of patients present a different picture. Of those patients who showed a major improvement (+ or ++), i.e. 9 of a total of 19 dysthymics, 8 received the drug. J.S., who was in receipt of the placebo, recovered spontaneously upon the solution of her very real environmental difficulties.

Some of the patients fluctuated in their symptoms before improvement became apparent. As an example, J.F.B.'s experiences under meprobamate are quoted:

> "During the first 2 weeks of treatment little change was noted but I found myself a little less tense in most things. However, at the beginning of the second 2 weeks this deepened to a depressive and gloomy state. At this stage I noticed a decided absence of 'emotionalism'. At the end of the treatment I noticed no change until the second day when there appeared a distinct tremor; this increased slightly, with a diminishing of the depression, until the tremor disappeared at the end of one week. I felt then decidedly more buoyant and yet secure and placid. Writing this after a lapse of time I find this buoyancy is not sustained, the uplift has receded. I have, however, lost the tension I had. This loss of excessive tension, as it were, is, I feel, a result of the treatment."

In analysing clinically the results of the effect of an ataraxic in tension states, the important factor of elimination of stress conditions whilst in hospital must be borne in mind.

Stress conditions of one kind or another were particularly marked in A.W., J.D., M.B.G., J.S., J.H., K.M., and D.G. Of these 7 patients the first three were gross hysterics in whom the stress situation arose largely from their poorly integrated personalities; only one of them (A.W.) showed marked improvement (see Table I), being on the placebo, whilst the other two (J.D. and M.B.G.) showed no appreciable improvement with meprobamate.

Of the four dysthymic patients in this category, two received the placebo and two the drug. Of the former only J.S. improved markedly (see Table I) whereas D.G. showed no improvement during the experiment but recovered afterwards, following group psychotherapy. J.H. and K.M. appeared to have responded favourably to the drug.

Psychological Assessment and Findings

TABLE II

The Significance of Pre-trial Matchings and Post-trial Changes

	Suggestibility	Critical Ratio (t)		
		Before trial	Of Changes	
Whole Group	0·0			
Anxiety		0·44	0·94	
Tension		0·35	0·70	
Headaches		0·15	0·31	
Total symptoms		0·38	0·91	
Dysthymics	0·81			
Anxiety		0·12	1·00	
Tension		0·51	2·26	=significant
Headaches		0·0003	1·10	·02–·05 level
Total symptoms		0·18	1·50	
Hysterics	0·58			
Anxiety		0·42	0·14	
Tension		0·02	1·17	
Headaches		0·52	1·00	
Total symptoms		0·48	0·36	

The drug and placebo groups, composed of hysterics and dysthymics, were compared to determine whether they were matched prior to the experiment in terms of anxiety, tension, headaches, total symptoms, and suggestibility. Table II gives the critical ratios (t) and shows that there were no significant differences. The groups were therefore satisfactorily matched in the severity of the illness, and in suggestibility. The table also shows the t-scores calculated on the changes resulting from the experiment. These were also not significant, showing the drug to exert no greater influence than the placebo.

The negative findings, using groups composed of both hysterics and of dysthymics, suggested a further analysis of the results with reference to basic personality. A comparison was made between the dysthymics receiving the drug and those in receipt of the placebo. The two groups were, again, found to be matched. No significant change occurred in the three symptoms when taken as a whole, or in the anxiety and headaches symptoms separately; there was, however, a tendency towards a relief of tension in those receiving the drug contrasted with those receiving the placebo (t=+2·26, significant 2–5 per cent. level of confidence). In order further to rule out the possible influence of suggestibility on this result, those subjects who received the placebo and who showed the greatest degree of suggestibility (S1) were compared on relief of tension with those placebo subjects who showed less suggestibility; no significant difference was established between the changes in the two groups (t=+·86). The superiority of the drug over the placebo, in its effect on tension, cannot therefore be attributed to suggestibility.

A similar comparison was made between the hysterics receiving the drug and the hysterics in receipt of the placebo. The two categories were found to be matched before the experiment in symptoms and in suggestibility, and there were no significant changes in any of the three symptoms, i.e. the drug was ineffective in this type of patient.

Summary and Conclusions

Meprobamate was found in this trial to act as a tranquillizing agent on certain symptoms and in a specific category of patients. The psychological assessment at the end of the trial tends to show that tension was influenced by the drug. As tension was the outstanding symptom in the trial subjects, the therapeutic outcome in this type of psychoneurosis was correspondingly satisfactory.

At the same time, psychological as well as clinical findings suggest that the dysthymic neurotic reacts to the drug in a positive way whereas the hysteric is not so affected.

Clinical impressions obtained during the trial confirm those of previous authors. The need for night sedation was eliminated in the majority of cases, and the benefit derived from the drug appeared to be greater in the instances of a more recent and less severe illness, with a less gradual onset of symptoms. The drug action differs from that of barbituric sedatives.

No skin rashes, as mentioned by other authors, were noted in this investigation, the leucocyte count remained unaffected by the drug, and no addiction occurred (Lemere, 1956). The only side effect in one patient of the experimental group was weakness of the legs and tremor during the first week of treatment.

Although meprobamate appears to be useful in certain specific instances, within the scope of this investigation, further research on similar lines seems to be desirable in order to provide greater confidence in its prescription.

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FOLIE À DEUX

A CASE OF FOLIE IMPOSÉE À QUATRE AND À TROIS

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DEFINITION OF FOLIE À DEUX

"FOLIE à deux is the transmission of delusional ideas from a psychotic to closely-associated individuals, who have experienced his domineering influence for a prolonged space of time. This condition may be transferred to three and more individuals" (Lasègue and Falret (14)).

INTRODUCTION

Cases of folie à deux are not as rare as one would expect, judging by their infrequent description in psychiatric literature. This view is also held by Ascher (3) who states: "Although only about 100 cases of folie à deux are on record, it is my belief that the disorder is commoner than would appear."

There are few clinical entities for which so many names have been proposed as for the one commonly known as folie à deux. This fact in my opinion, is mostly due to a lack of conceptual agreement as regards: essential preliminary factors, mode of onset, transmission, the nature of symptoms and their duration in the passive partner. The question of consanguinity has been also raised and debated. To stress the divergence of opinion I only need to quote an incomplete list of names supposed to be synonymous such as: infectious, contagious, reciprocal, induced, imposed, simultaneous, communicated insanity. Tuke (17) called it double insanity and Gralnick (8) named it Psychosis of Association.

As regards the term "folie à deux" "à trois" "à quatre", etc., Kallmann and Mickey (13) remark that it is of little use apart from the opportunity it provides the psychiatrist of "counting in French"; for in fact it conveys little to the reader apart from the number.

HISTORY

Isolated clinical cases were reported early in the nineteenth century, as for example in 1819 by Berlyn (5) and in 1838 by Ideler (12). But it was Baillarger (4) who in 1857 and again in 1860 gave a more detailed description of the condition. He wrote: "It happens sometimes that two or more members of the same family are brought to the psychiatrist on the same day, each suffering from Monomania, and each exhibiting identical delusional trends." He continues, that after having examined one of them, it is possible to forecast delusions of the other. Baillarger emphasized that this condition did not develop simultaneously in both individuals, but that there was an interval of several months between the outbreak of psychosis in the one and the psychotic response in the other. The condition he called Contagious Delirium.

Sporadic cases were reported after that, such as the one described by Hofbauer (11) in 1864, but it was not until 1873 that Lasègue and Falret (14) made their classical communication to the Medico-Psychological Society of

Paris. They were the first to coin the term of folie à deux or folie communiquée.

At this stage, although the conception of folie à deux was broadened and better defined, there still remained many points which required clarification. Was the transferred psychosis to be permanently induced? Had the delusional ideas to be identical in both partners? Was a psychotic predisposition permissible in the passive partner?

Cases reported differed in nature and circumstances. Thus arose the need for further subdivision. It was Marandon de Montyel (15) who recognized the need for classifying "folie à deux" in three clinical categories.

Classification of Marandon de Montyel

1. *Folie Imposée*

In this group, one of the individuals is the active partner. He is the more intelligent and the first one to develop delusions, which he gradually imposes on the passive partner. The "lesser" partner although deluded, need not be hallucinated. In fact he is not really psychotic in the strict sense of the term, but only "un malade par reflet" who will return to normal after separation from the active element. Predisposition plays only a minor role. Suggestion and intimacy are important.

2. *Folie Simultanée*

Here the factor of transmission is either non-existent or only negligible. The delusions happen to develop simultaneously in the two subjects because of various concomitant factors, the most important ones being: morbid predisposition, prolonged intimate association and—what is most important—the same precipitating trauma acting simultaneously on both. This condition is not likely to subside with separation of the two individuals. Delusions and hallucinations may be present.

3. *Folie Communiquée*

In this category, the passive partner resists for a variable length of time, but eventually succumbs to the overpowering influence of the psychotic, developing finally a delusional and hallucinatory state. But although the delusional state is shared in the beginning, the passive partner soon follows his own trend, developing a psychosis *sui generis*, which does not subside after separation. Predisposition and hereditary constitution are said to play a major role.

Modern Trends

The modern trend is to eliminate subdivisions as far as possible and to beware of diagnostic labels. Nevertheless and especially in the case of folie à deux with its numerous synonyms, it would be impossible to discuss the matter, without some basic agreement of conception. Marandon's classification may be open to criticism, it provides however a workable guide in differentiating diverse clinical pictures. Modern writers have again discarded this classification, thus adding to the confusion of the term. To stress the point of conceptual disagreement I will quote from modern writers. Henderson and Gillespie (10) remark: "Suggestibility plays a part among other factors in the genesis of 'folie à deux' or 'communicated insanity', which is the term applied when two persons closely associated with one another suffer a psychosis simultaneously and when one member of the pair appears to have influenced the other . . . It is usually a paranoid or manic depressive state." Here the term "communicated" is synonymously used for folie à deux and it is also remarked that they "suffer a psychosis simultaneously". No further details are given, i.e. whether this condition is permanent or likely to subside after separation; thus this description, although rather sketchy, could be used for all three of Marandon de Montyel's varieties.

Bleuler (6) states: "It happens, that paranoid or paranoiac, and rarely hypomanic patients not only can make those with whom they live close together believe in their delusions, but they so infect them, that the latter under conditions themselves continue to build on the delusions." This description would be more in keeping with Marandon's *communiquée* variety.

On the same topic, Aubrey Lewis (1) writes: "Unless there has been predisposition at hand, the condition is a reactive affair, which may have no deep roots and clear up quickly as do prison psychoses if the circumstances are changed." This again is a different description, corresponding more or less to the *imposée* variety.

We can see that in these three descriptions folie à deux assumes a different meaning. It is therefore suggested to discontinue the use of the term "folie à deux" and to re-introduce Marandon de Montyel's classification. This means that emphasis would be laid on the nature of the transmitted psychosis, the number completing only the circumstances of a particular case. In this way we would speak for example of folie simultanée à deux, folie simultanée à trois, folie communiquée à quatre, or whatever the case may be.

Another point of importance which requires clarification is the question of whether the use of the term "folie à deux" (or any other term) is justifiable in the presence of close blood relationship. Thus Kallman and Mickey remark: "The term has been used to describe the occurrence of various psychotic syndromes in entire sibships or other family units and also for twins who developed schizophrenia or a manic depressive illness." According to Kallman 85 per cent. of Monozygotic twins develop schizophrenia, if one of the pair is affected. It is therefore understandable that the use of "folie à deux" in twins, be they Mono- or Dizygotic, be they reared apart or not, does not seem justifiable to many writers, owing to the preponderant constitutional factor. The concept of folie à deux would lose its significance if used indiscriminately in blood relatives. To prove this point, Kallman quotes a case in which psychosis co-exists in two parents and seven children and asks: "Would it be justifiable to call this a 'folie à neuf'?" He mentions another case of multiple psychosis involving both parents and five children. Here also the term "folie à sept" would appear out of place. Kallman continues: "The additional restrictive qualification to be advocated is that similar delusional syndromes should not be called 'induced' or folie à deux if they appear in units of blood relatives, and if the primary significance of the factor of blood relationship cannot be safely excluded."

From this point of view it is interesting to note that a great number of cases of folie à deux described in medical literature occurred between consanguineous individuals. To quote only a few, Adler and Magruder (2) speak of folie à deux in identical twins, Greenberg (9) mentions a case occurring between mother and son, Page (16) describes a case of "psychosis of association" involving a mother and 3 sons, and again Wellisch (18) a case between mother and son. Similarly Craike and Slater (7) discuss a case of folie à deux in uniovular twins reared apart.

CONTRIBUTORY AND CONCOMITANT FACTORS

Most writers agree that prolonged social isolation, strong emotional ties, domination and forceful suggestive powers in one, coupled with a high degree of suggestibility and submissiveness in the other, play an important role in the diverse varieties of folie à deux. Viewed from this angle "passionate love" with its turmoil of emotions and irrationality may be considered sometimes as a "modified" folie à deux; and not seldom in fact may lead to the tragic end of "felo de se à deux".

Marandon de Montyel holds the view that predisposition and "morbid impression" in the passive partner, are of primary importance. He doubts whether all other factors taken together could ever be effective, in the absence of the last two mentioned ones. It is generally said that mental defective weds mental defective. This in my opinion may also apply in the case of pre-psychotic personalities. Thus it may be that those who form close relationships with a pre-psychotic individual, either in the form of friendship or marriage, are themselves potential carriers of a latent psychosis. This point of "mate selection" is also emphasized by Kallman, in cases of folie à deux occurring between husband and wife.

Predisposition is obviously necessary in the *simultanée* and to a lesser degree in the *communiquée* variety; but it may also play a part in folie *imposée*. In those cases where it is totally lacking, the imposed insanity is not a true psychosis, but more in the nature of a hysterical phenomenon, due to strong suggestibility, submissiveness and close affective relationship.

CASE REPORT

This case occurred about two years ago in a nursing home in the north of England. The central figure is a doctor suffering from a manic-depressive psychosis. He had some psychiatric training, having worked in a mental hospital for a year or so. The second protagonist, the main figure in the constellation of "lesser partners" is a middle-aged woman. She had always conveyed the impression of being rather odd and aloof, but could not be described as outside the flexible limits of normality. She also happened to hold a responsible position in the nursing home in question, being one of the directrices. The third person involved was a patient, a youth of seventeen, an emotionally immature personality with pronounced schizoid features. Finally there were two passive partners, involved to a lesser degree, two psychoneurotic patients (male), with predominant hysteric and phobic traits. Thus we have one central figure and four lesser partners with varying degrees of involvement in this case.

The doctor in question, whom we will call A., suffered from a manic-depressive illness for some years. He was 28 years old, and on one occasion he had been a voluntary patient in a mental hospital. I met him for the first time at the nursing home one year prior to the occurrence of the present case. He was not a patient, but stayed there as a guest of the previously mentioned directrice, with whom he had established a very close relationship. On that occasion he was in a depressive phase, and Mrs. B., the directrice, asked whether I would mind looking after him unobtrusively. I succeeded in persuading him to undergo a course of electro-convulsive therapy. He improved considerably and I seized the opportunity to follow up physical treatment with intensive psychotherapy of some duration. Dr. A. was of good intelligence and insight, and seemed to benefit from psychotherapy. Eventually he got sufficiently well to take up his post again at a mental hospital, where he managed all right for about 10 months.

The following year, at the time in question, he came to visit the nursing home again. By an unlucky twist of circumstances, the chief visiting psychiatrist was abroad on holidays, while I was taken ill unexpectedly. There ensued a gap of two days in which no visiting psychiatrist was available at the nursing home, to deal with the patients. This course of events became the starting point of interesting, though highly unpleasant developments. Dr. A. was this time in a hypomanic phase. He saw an opportunity for intensive activity, and act indeed he did. He was in the "live wire" state, full of exuberant energy and verbosity. Nothing was too difficult, no case seemed too complicated for him. He took full charge of the nursing home and began to treat patients.

The first victim to fall under Dr. A.'s hypomanic spell was Mrs. B., the directrice, who was emotionally involved with the doctor. She followed him around in a subservient and ecstatic mood, watching with veneration the "miraculous cures", as they were called by the hypomanic magician. She lived almost in a trance, incapable of realizing the true situation.

Dr. A.'s euphoria and overactivity took hold of her, so that she soon became but a reflexion of his personality. Both of them were constantly on the move, talked incessantly and interfered with the routine of the nursing staff. Dr. A. believed that he possessed extraordinary therapeutic powers; in fact his hypomania had a true schizophrenic flavour. The matron of the nursing home made a desperate attempt to bring Mrs. B. down to earth. She reminded her of Dr. A.'s past history, of the course of electroplexy he had undergone only ten months before. But she was sharply rebuked and told to mind her own business.

Two male patients with hysteric and phobic traits were the chief recipients of psychological treatment. One of them, Mr. C., an ex-pilot, suffered, apart from other complaints, from an intensive fear of ever flying again. Dr. A. belaboured him and, in the space of 24 hours, he bluntly declared him as cured. Similarly the other patient, Mr. D., who had marital difficulties on account of sexual disturbances, was informed that his troubles were over. Both patients accepted his suggestion and regarded themselves as cured. The ex-pilot declared that he could fly again. Where long and laborious psychotherapy had failed, the hypomanic impact, with its authoritative and infectious optimism had succeeded.

Mrs. B. felt triumphant—and frankly, who can blame her—for this was a "miraculous cure" indeed; though unfortunately short lived. Dr. A., Mrs. B. and these two patients formed an inseparable and enthusiastic quartette. The criticism, amusement and crude jokes of the rest of the nursing home community did not disturb them. Dr. A. insisted that it was of the utmost importance to show this astonishing cure to Dr. L., the chief psychiatrist. To wait until Dr. L.'s return was out of the question, as the matter was too important. True, the chief psychiatrist was holidaying abroad, but what did this matter! They would fly, all of them. Right away!

So far there is nothing unusual in the patients' acceptance of their cure. It is simply a case of hysterics accepting a strong suggestion. But one would have expected them to return to their homes, to their families, instead of taking to the air. Both patients however seemed enthusiastic about the plan. In their eyes, too, this was a matter of urgency. As it happened, neither the doctor nor the two patients possessed sufficient means to finance the air-trip to Italy, but this was no obstacle for Dr. A.; Mrs. B. would pay for the lot! And so she did.

During my two days of illness, I had been kept informed by the matron of the developments at the nursing home. When I finally arrived on the third day, I found the party ready for the flight and had no opportunity to stop them. And so this constellation of four took to the air and descended upon the unsuspecting chief psychiatrist in Italy. Dr. L. was well acquainted with Dr. A.'s past history. He pleaded with him as well as with Mrs. B., urging them to return to England, but both of them were impervious to reason. Finally the chief psychiatrist succeeded in getting in touch with the British Consul and in having Dr. A. repatriated to the U.K.

Meanwhile I had a hard time to get the nursing home back to normal working conditions, as it was completely thrown out of gear by Dr. A.'s short but fervent activity. I was almost on the point of regaining control of the situation, when the second hurricane broke loose. Mrs. B. was the first one to return from that memorable trip. She was euphoric, garrulous, overactive and conveyed the impression of a person extremely pleased with a work well done. Notwithstanding the cold reception—Dr. L. wrote "they turned my holiday into a nightmare" —she showed no sign of disappointment, or realization of the futility of her enterprise. The two patients, having meantime cooled off and come to their senses, did not return to the nursing home. It was quite an ordeal for them to get back to England. Dr. A. however, after successful disengagement from the repatriation officials, appeared on the scene again and renewed his stay at the nursing home. By this time he was in a fully blown maniacal state, unmistakable even to the most unobserving layman. He was overactive to the extreme and his delusions of noble birth and omnipotence became more pronounced and persistent. I had to speak to Mrs. B. She was after all the directrice. I explained to her that it would be impossible for me to take any responsibility in the nursing home unless Dr. A. was impeded to interfere with the patients. My request fell on deaf ears.

On my next visit to the nursing home, I learned that Dr. A. had surrounded himself with new apostles, some mocking, some doubtful; and yet there was a new victim to fall under his spell. This was the formerly mentioned seventeen-year-old youth; an effeminate, immature and pronouncedly schizoid personality. He came to the nursing home on account of shyness, difficulty of concentration, incapacity to settle down to his studies, as well as some minor manifestations of juvenile delinquency. Dr. A. and the youth, whom we will call "E.", became inseparable. The one commanded, the other obeyed blindly. It was almost unbelievable how Dr. A., who at this stage was frankly psychotic, could have possibly exerted such strong influence on E., who, although of schizoid make up, was after all rational and in touch with reality. The matron informed me that both had absconded the night before, had visited the village pub, causing great consternation and bewilderment among the public. Various complaints from all quarters began to reach the nursing home.

My position was very unpleasant. It seemed hard to take steps against a colleague; and besides I was technically subordinate to the directrice of the nursing home. Having treated Dr. A. the year before, I pleaded with him to undergo treatment again, or alternatively, to seek admission as a voluntary patient in a mental hospital. He refused either. I made it clear to Mrs. B., that unless Dr. A. transferred his residence elsewhere, I would be left with no alternative but to have him certified. It did not impress her. She asked me not to worry, said that everything was all right, and that the chief psychiatrist approved of it all. It was clear that she was frankly deluded.

At this stage there was a solid triangle formed by Mrs. B., Dr. A. and the young man E.; and, living as they did in close association, they derived great moral courage and strength from this symbiosis. Both of them idolized the doctor and believed in him as a kind of Messiah. It was by now a case of folie imposée à trois.

As Dr. A. was free to move, complaints from the neighbourhood reached the nursing home in increasing numbers. I had no choice apart from certification and told Mrs. B. about it. The same night I received a telephone call from Dr. A. He asked for an appointment on the following day. The feeling of impending danger brought a temporary remission in his mental condition. I agreed to see him and arranged also for a colleague psychiatrist to be present at the interview.

Dr. A. arrived in the company of Mrs. B. After introducing both to my colleague, I invited Dr. A. to give his version of the last events. He began by stating that there was nothing the matter with him whatever. Then he proceeded with a frontal attack on psychiatric treatment and it must be conceded that part of his criticism was sensible enough. He next went on to accuse me of plotting against him and of not understanding his inborn therapeutic powers. Soon enough he made it transpire that there was royal blood in his veins, and that he could not be judged by common standards. Gradually he began to lose the thread of his conversation as his flight of ideas did not permit him to dwell for long on the same topic. He expressed frank delusions of grandeur and stated that he was working for the Foreign Office. He spoke without interruption for over an hour and would undoubtedly have continued for longer, were he allowed to do so.

For fairness' sake I asked the other psychiatrist to give his opinion to Dr. A. He did so and explained to Dr. A. that he was in urgent need of mental treatment. He also volunteered his help as regards admission to a mental hospital. But again Dr. A. refused flatly, and went out to an adjoining room. I then invited Mrs. B. who had witnessed the interview throughout to express her opinion. The conversation went approximately as follows: "Do you agree that Dr. A. is mentally ill?"—"No, I don't. You can check, he is associated with the Foreign Office."—"Supposing he worked for the Foreign Office, would that prevent him from becoming mentally ill?"—"But you can check, he works for the Foreign Office". She had no realization of the seriousness of Dr. A.'s mental condition, and for that matter no appreciation of her own condition either.

That same day circumstances forced me to make arrangements for certification. The Duly Authorized Officer, as well as a Justice of the Peace, arrived at the nursing home. Dr. A. arrived on the scene unperturbed and was invited by them to have his say. He sat down assuming an over-erect position, holding his walking stick in a sceptre-like fashion and spoke again of his noble birth, his astonishing healing powers, and his persecution by the ignorant, as for example myself.

His uninterrupted speech had lasted for a considerable time when he was finally invited to wait in another room. At this point an unexpected incident occurred. There was a knock at the door and Mr. E., the young man, made his entrance. He seemed very agitated and stated that Dr. A. was being wrongly accused and that there was nothing whatever the matter with him. He affirmed that I was conspiring against Dr. A. because I was jealous of his extraordinary successes. Although the position was explained to the boy by the Justice of the Peace, he was incapable of appreciation.

For technical reasons –I suspect the D.A.O. wanted to check with the Foreign Office—it was decided to postpone Dr. A.'s removal to a mental hospital until the following day. The same night I was awakened by the telephone and informed by the matron that both Dr. A. and the boy had eloped from the nursing home. The police were informed and eventually they were found and detained overnight. Next day Dr. A. was admitted to a mental hospital as a certified patient, while the young man was brought back to the nursing home.

After Dr. A.'s exit from the scene, the youth regained his previous personality in the space of four days. He remained the same schizoid and emotionally immature individual as before, but he was no longer deluded about Dr. A.'s persecution, nor did he regard him any more as a miraculous healer. He came to me on the fifth day and apologized for the inconvenience he had caused.

Mrs. B.'s return to "normality" was a more drawn-out process. Soon after Dr. A.'s certification, she pretended to have known all the time that he was mentally ill. In contrast to her former hypomanic behaviour, she gradually grew distant, aloof and somewhat suspicious. I gained the impression that she was holding back and that she was afraid of being sent to a mental hospital herself. After a month or so, she reverted to her former self.

Discussion

In all four satellites, the separation from the active partner was followed by a return to previous personality. This fact by itself makes this case eligible for the term "folie imposée" in the sense of Marandon de Montyel's definition. In the case of the two psycho-neurotic male patients, suggestion and heightened suggestibility played an important role. Theirs was not a true psychotic reaction, except perhaps for the short duration of the air-trip from England to Italy. I think their response was more of a hysterical nature. Mrs. B.'s reaction was frankly psychotic, the pattern of her transient psychosis and delusions being almost identical with that of her active partner. She was the most emotionally involved of the "lesser partners". Predisposition probably played also a part in it, for it is difficult to know, without a closer examination, what was hiding behind her façade of "oddity". It may be of some interest to mention—especially as regards "mate selection"—that her daughter had chosen to marry a schizophrenic patient some years previously.

The adolescent, who had a marked predisposition, reacted psychotically in that he was unable for a time to keep in touch with reality, and also because he shared some delusions with the active partner. It would be incorrect however to state that the pattern of his temporary psychosis was identical with the original one. In this respect I share the opinion of Woltring (19) when he states: "The opinion that we can speak of folie *communiquée* or *imposée* only if the secondarily induced psychosis is identical in form and content with the primary psychosis, seems to me to be too one-sided."

To conclude, I think that Lasègue's and Falret's classical definition of folie à deux should be broadened as follows: (*a*) The transmitted psychosis may be of a temporary or permanent nature, and may or may not subside after separation of the persons involved; (*b*) Delusional ideas and other psychotic traits may, but need not be identical; (*c*) In the *imposée* variety, true psychosis need not be present in the passive partner, but the clinical picture may be more in the nature of a hysterical reaction.

SUMMARY

1. The concept of folie à deux is discussed and the adoption of Marandon de Montyel's classification advocated.

2. It is suggested that owing to the preponderant constitutional factor, it may be advisable to exclude the term folie à deux among close blood relations as advocated by Kallman and Mickey.

3. A case of folie imposée à quartre and à trois is described.

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THE STABILIZING EFFECT OF OCCUPATIONAL THERAPY ON CHRONIC PSYCHOTICS WITH A TENDENCY TO AGGRESSIVE FORMS OF BEHAVIOUR

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BICKFORD (2) has underlined the need for devoting more attention to the chronic psychotic patient and stressed the possibility of accelerating what he believes to be the inevitable remission of the psychosis. There may be a current tendency to think in terms of the physical or pharmacological treatments in handling psychotic patients and to overlook the value of more conservative measures. Myerson (5) attempted to revive interest in the latter by coining the term "total push" and providing a theoretical basis for the activities organized. Galioni *et al.* (3) presented the results of a similar programme which showed 18·5 per cent. of the experimental group "separated" from the hospital as compared with 5 per cent. of the controls. Kamman *et al.* (4) show that while the initial improvement certainly takes place, unless careful placement is achieved relapse occurs.

This study shows the value of the most conservative of treatments—occupational therapy—in a refractory ward and the apparent superiority of this method to pharmacological treatments.

BACKGROUND

Runwell Hospital is built on the unit principle and the wards are graded roughly according to behaviour level. The most refractory ward contains 38 patients—schizophrenics and epileptics predominating—and is the lower floor of a block standing in its own garden. In the garden is an occupational therapy hut, normally staffed by one trained therapist and a nurse. Owing to shortage of staff, when the therapist is absent (on leave, or sick) or called to the main therapy unit, no occupational activities have been organized. Regrettably, this situation has arisen not infrequently. As the population of the ward has remained relatively static—29 of 38 patients have been in the ward for 3 years and the number of exchanges in the other 9 beds has been small—it has been possible to observe the effects of occupational therapy on ward behaviour as a whole. Bennett and Robertson (1) planned an enquiry into the effects of habit training in a similar group (chronic schizophrenics) but felt that their investigation was weakened by the subjectivity of the records and ratings, and possibly the increased intervention of the nurses in the experimental group. In this study the information used has been taken from ward reports retrospectively. On the whole, only objective events or actual happenings are recorded in ward reports. As this study was not planned in advance, the nursing staff could not have been biassed in their reports for one phase or the other by knowledge of the investigation.

FINDINGS

It was felt that a seasonal variation in ward behaviour might occur, as in winter the patients have much less facility for exercise than in the summer months. The ward reports were thus examined for three corresponding winter periods (of 92 days) and three summer periods (of the same duration). Day and night reports have been presented separately and histograms (Fig. 1) have been constructed from the tables (Table I).

TABLE I

	Day						Night					
Date	July 1953 to Oct. 1953	Aug. 1954 to Nov. 1954	July 1955 to Oct. 1955	Oct. 1953 to Jan. 1954	Dec. 1954 to Mar. 1955	Oct. 1955 to Jan. 1956	July 1953 to Oct. 1953	Aug. 1954 to Nov. 1954	July 1955 to Oct. 1955	Oct. 1953 to Jan. 1954	Dec. 1954 to Mar. 1955	Oct. 1955 to Jan. 1956
Season	S	S	S	W	W	W	S	S	S	W	W	W
Occupational therapy	No	No	Yes	No	Yes	No	No	No	Yes	No	Yes	No
Reports:												
Restless, noisy, over-active, etc.	123	145	46	126	70	83	161	227	118	288	165	145
Fighting	14	16	2	9	5	11	6	1	1	3	2	2
Casualties	26	12	6	18	11	11	6	2	3	4	0	2
Windows broken	0	2	2	8	0	2	2	0	2	2	1	0
Emergency sedatives administered	104	102	28	109	40	66	181	254	230	291	207	280

Occupational therapy clearly exerts a tranquillizing effect on daytime behaviour in the ward. It was questioned as to whether the changes shown on withdrawal of occupational therapy were due to a general deterioration in the ward or due only to the deterioration of a group within the ward. The 1955–56 records for extra sedation were examined for the summer (with occupational therapy) and winter (without occupational therapy). All the significant changes were found to occur in the 29 static patients and the differences between winter and summer periods are shown for these patients (Fig. 2).

It will be seen that the deterioration in 6 patients accounts for most of the increased extra sedation by day and in 3 of these by night. These 6 patients were in the ward throughout the period under review. Five of them were normally occupied in the occupational therapy department. The sixth is a ward worker whose work was reduced by the need to find jobs for other unoccupied patients and made more difficult by the presence of the larger numbers continually on the ward and consequently in the way. Five of the six patients were schizophrenics, the sixth was suffering from an epileptic psychosis. Of the three patients who, paradoxically, showed improvement without occupational therapy, two were epileptic and the third a catatonic schizophrenic with clear-cut phases of excitement. Such a phase occurred during the occupational therapeutic period and did not recur in the second period. This patient attended occupational therapy, while the two epileptics were generally ward workers of poor quality.

Finally, it was noted that the increasing emergency sedation did not reflect the total increase in sedation comparing the period with occupational therapy against that without it.

Pricing the sedatives used for the two three-month periods in 1955–56, it was found that expenditure had risen from £73 6s. 0d. in the first period to £160 7s. 0d. in the second period, for the whole ward. Comparing expenditure on the 29 patients at risk throughout the study, this rose from £11 8s. 6d. to £117 18s. 6d. The largest increase was on chlorpromazine and the next on reserpine. These drugs were available throughout the six months period (and,

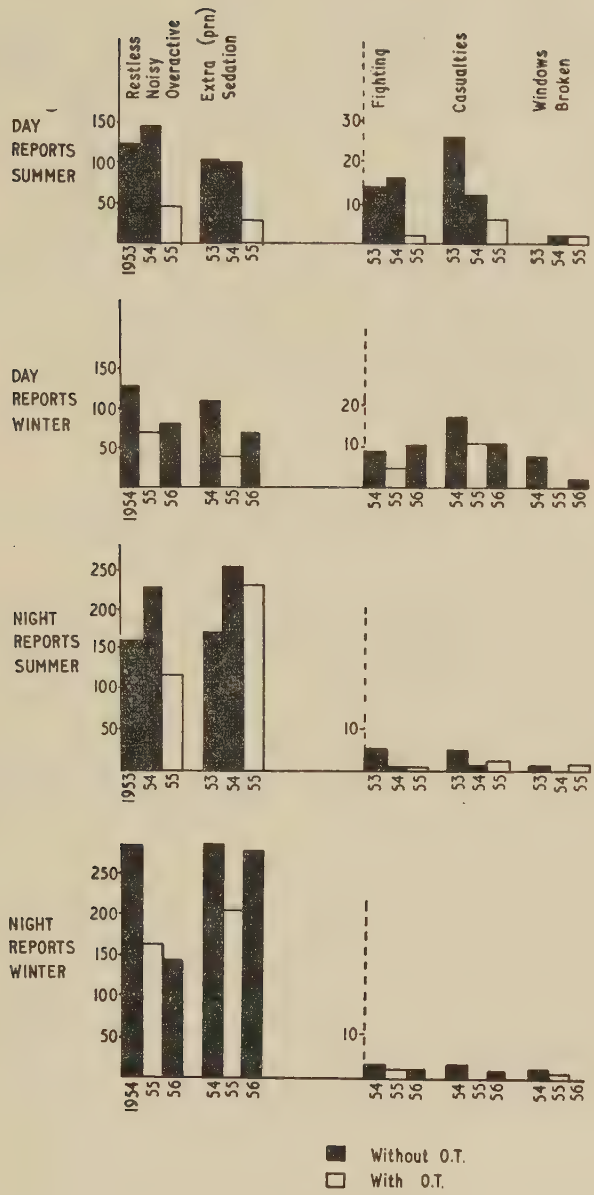

FIG 1.

indeed, for more than 2 years before this). No trial was being conducted with them and there seems to be no other reason for this increased prescription except that ward behaviour was deteriorating and the drugs had been prescribed symptomatically for their quietening effect on 11, as against 5, patients. Nevertheless, it will be seen that overall behaviour seems worse in the second period.

It may be said that the absence of occupational therapy increased the drug bill by £87 for the ward in three months. The occupational therapist actually handled 12 patients from this ward and 12 from the other ward in the block.

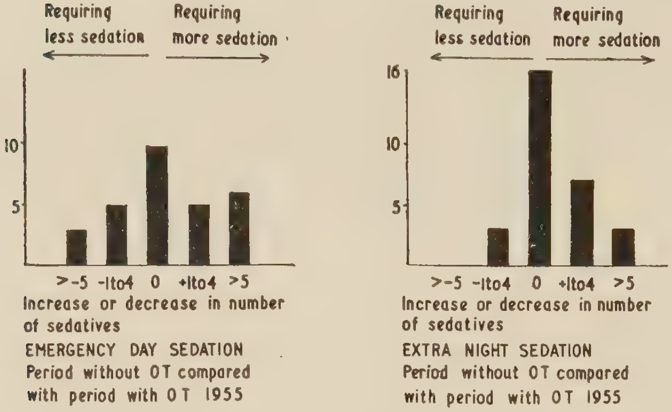

FIG 2.

Half the salary of a trained occupational therapist for three months would be less than £70 at the top of the scale or £17 (20 per cent.) less than the drug bill.

SUMMARY AND CONCLUSIONS

Occupational therapy has a quietening effect on ward behaviour in aggressive patients, which is more marked than that produced by the symptomatic prescription of tranquillizing agents. As a corollary, the necessity of standardizing ward conditions when organizing trials of new drugs in chronic psychotics is clearly shown.

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THE EFFICACY OF PARENTROVITE IN THE TREATMENT OF A GROUP OF SENILE PSYCHOTICS

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INTRODUCTION

THE recently-introduced vitamin preparation "Parentrovite" has been found to be of value in a variety of organic psychotic episodes (Gould, 1954). Since, however, there are few (if any) reports dealing with its efficacy in the treatment of senile psychotic patients in mental hospitals (Baker, 1956), the following investigation was undertaken.

It is a well-established fact that poor or defective memory is an almost invariable result in the senile psychoses. Because of this, and the fact that memory can be assessed with some accuracy, it was decided to undertake a limited trial of the preparation to determine, under strictly controlled conditions, its effect on the memory of such patients and from this and other recorded behavioural changes to evaluate its therapeutic efficacy.

METHOD

Fifty male senile psychotic patients over the age of 65 were used in the experiment. The duration of stay in hospital varied from several months to fifty years. Care was taken to exclude:

(1) Patients in whose case there was evidence of mental deficiency;
(2) Cases with organic brain lesions;
(3) Subjects with gross pathology elsewhere in the body, in itself capable of causing mental symptoms, e.g., cardiac, respiratory or renal disease.

The fifty patients, clinically all of whom manifested a memory defect, were divided at random into two groups; one to receive "Parentrovite", the other to receive a placebo.

It was found that the two groups were well matched in terms of age and memory efficiency. The mean age of the "Parentrovite" group was 72·6 years, S.D. 5·5. The range was from 65 to 83 years. The mean age of the placebo group was 71·3 years, S.D. 4·8, with a range from 65 to 86 years. The mean memory quotient (M.Q.) of the experimental group was 69·8, that of the control group, 71·6. There were no statistically significant differences between the experimental and control groups in respect of age or memory.

None of those concerned in the administration of the preparation (J.A.K.) or in the recording of the patients' progress (D.W.) knew which patients belonged to the "Parentrovite" or placebo groups.

The experiment lasted six weeks. This period was divided into three fortnightly phases; during the first and last none of the patients received medication of any kind. During the second phase patients received either "Parentrovite" or placebo, according to the group to which they belonged.

All the patients were tested on the Wechsler Memory Scale Form 1 (1945) twice during the first fortnight, once at the end of the second fortnight and once at the end of the third fortnight. The scale consists of seven subtests, comprising: "Personal and Current Information", "Orientation", "Mental Control", "Logical Memory", "Memory Span", "Visual Reproduction of Design", "Associate Learning". The subject's total score is translated into an equivalent "Memory Quotient" (M.Q.). This quotient can best be understood by applying a classification similar to that used for the Intelligence Quotient (I.Q.)—a "Memory Quotient" of 90 to 110 is average, above 100 somewhat superior, 80 to 90 is dull, 75 to 79 seriously defective, 74 and below, pathologically so. The test scores take account of the normal decline of memory with age. In all, 200 separate examinations with the memory scale were carried out. The mean of the first two tests was assumed to be a more valid memory index for each patient than the result of one assessment. The effects of long periods of hospitalization and consequent lack of mental stimulation over a long period might well have resulted in a spuriously low result if the patient was suddenly confronted with a new and unexpected mental exercise. The third assessment was designed to show any significant change in the patients' memory due to the administration of "Parentrovite" and whether this was significantly greater than the effects of test-sophistication, test-retest practice effect, etc., in the placebo group. The purpose of the fourth assessment was both to determine whether possible improvement was maintained and whether the vitamin preparation exhibited a delayed reaction.

During the period covered by the experiment the patients were all under psychiatric supervision. Daily Behaviour Charts, which were modifications of the Worcester Behaviour Rating Scale (Malamud *et al.*, 1946), were kept by the nursing staff.

Care was taken that the patients' daily routine was altered as little as possible.

"Parentrovite" (Vitamins Ltd., London) was administered by intramuscular injection. The intramuscular, rather than the oral, route was used to exclude the possibility of deficient absorption. During the first week three injections of "Parentrovite" Forte were given, followed during the second week by three injections of "Parentrovite" Maintenance. The placebo or control group received the same number of injections, though of an inert fluid similar in appearance to the active preparation.

RESULTS

Six of the "Parentrovite" patients reported subjective improvement during the phase of receiving the injections and shortly after. Their comments were: "I feel brighter . . ."; "I feel different, more free . . ."; "No longer depressed . . ."; "More steady . . .". Of the placebo group one patient reported that he felt better.

Seven of the "Parentrovite" patients showed objective improvement as against three of the control group. The improvement manifested itself in increased activity and spontaneity in the previously apathetic. There was an increased interest in entertainments and social contacts, and better co-operation. Two of the "Parentrovite" patients showed considerable physical improvement; one of them—bedridden and incontinent of urine and faeces—became stronger, of clean habits, and gradually became ambulant. One patient in the placebo group died of cerebral thrombosis. Three patients treated with "Parentrovite" have been discharged from hospital as "Recovered".

TABLE I

Changes in Mean Quotient (M.Q.) for the "Parentrovite" and Placebo Group

	No Medication (A)	"Parentrovite" or Placebo (B)	No Medication (C)	Significance
"Parentrovite" Group ..	69·8	77·1	82·0	F ratio=3·36*
Placebo Group	71·6	76·5	78·6	F ratio=·59†

* Significant between ·05 and ·02 levels. † Not significant.

The rise in the mean memory quotient from 69·8 to 77·1 following the administration of the "Parentrovite" was significant beyond the ·01 level (t=3·75). Similarly, the rise of 77·1 to 82·0 following the removal of the preparation was significant beyond the ·01 level (t=3·55). There was no significant change in the group who were having the inert preparation or placebo. Between the rises of the experimental and placebo group from condition A to B and from B to C there were no significant differences. The rise of the "Parentrovite" group from A to C was, however, significantly greater than the placebo rise from A to C (t=2·4), significant between ·05 and ·02 levels.

TABLE II

Distribution of Changes in Memory Quotient (M.Q.) Between the First Period of No Medication and the Fourth Assessment

M.Q. Changes	Vitamin Group	Placebo Group
−15 to −11 M.Q. points	0/25	1/25= 4%
−10 to −6 M.Q. points	0/25	0/25
−5 to no change	2/25= 8%	4/25=16%
+1 to +5 M.Q. points	5/25=20%	4/25=16%
+6 points or more	18/25=72%	16/25=64%
+11 points or more	13/25=52%	9/25=36%
+16 points or more	8/25=32%	6/25=24%
+21 points or more	6/25=24%	3/25= 9%
+26 points or more	6/25=24%	1/25= 4%
+31 points or more	2/25= 8%	
+36 points or more	1/25= 4%	

DISCUSSION

These results show that there is a tendency for patients in the present sample, treated with "Parentrovite", to show a significantly greater increase in memory quotient than the group treated with the inert preparation or placebo.

The absence of a significant difference between the increase of the "Parentrovite" and placebo groups from conditions A to B (Table I) and from B to C, yet an overall significant increase of the "Parentrovite" group from A to C compared with the control group rises over the same period, would seem to argue for two things:

(1) The possible delayed action of the vitamin preparation, especially when dealing with an aged population;

(2) Since many subjects in the present experiment had been hospitalized for some considerable time, it is reasonable to assume that the effects of the extra mental stimulation were more likely to become manifest as the experiment progressed rather than at the beginning. This, combined with the possible delayed action of the vitamin preparation, might account for the difference.

The following interesting facts emerged from the experiment:

(*a*) Thirty-two per cent. of the total sample of fifty cases were of at least normal memory (M.Q.$=90+$) at the end of the experiment. Nine of these came from the "Parentrovite" group and seven from the controls.

(*b*) Twenty-six per cent. of the total sample had Memory Quotients in excess of 100 after the experiment (seven came from the "Parentrovite" group and six from the controls).

Here we see a significant percentage of senile psychotic patients improving in memory as the experiment progresses, markedly in contrast to their pathologically poor memory at the beginning of the experiment. Forty-four per cent. of the "Parentrovite" group showed rises in excess of, or equal to, 15 points and 64 per cent. with 10 or more points increment (Table II).

This contrasts with the control group changes of 36 per cent. with rises in excess of 10 points and 28 per cent. with increments greater than 15 points. The results would seem to suggest that a significant proportion of those patients suffering from a memory disorder, presumed to be associated with cerebral-vascular changes and therefore irreversible can, in fact, be so stimulated as to register significant increases in memory efficiency. This can be seen from the control group treated with the inert preparation. It points to the fact that although, clinically, all of the patients in the control group showed a memory defect prior to the experiment and that there was a correspondence between this and the first assessment of the Wechsler Memory Scale, some of these subjects were capable of "learning" or profiting from the continued retestings, whilst others were not. The experimental group receiving both the extra mental stimulation and the active preparation made even more significant changes. All in all, the experimental group changes suggest the beneficial influence of the vitamin preparation, plus the effects of the extra mental stimulation and individual attention, whilst the control group changes show that the organic picture is, to varying degrees, clouded by a functional element which responds to such environmental variables as attention, encouragement and increased mental stimulation.

No local reaction was noted following the injection of "Parentrovite". There was only one case of general reaction where the paraesthesia of "cold" was the outstanding feature with marked respiratory distress.

SUMMARY

Twenty-five male subjects suffering from senile psychosis were treated by six intramuscular injections of vitamin preparation "Parentrovite" controlled by twenty-five similar cases receiving an inactive preparation or placebo. The two groups were found to be well matched in terms of age and memory.

The encouraging results from the experimental group treated with "Parentrovite" suggest that further trials of the preparation should be undertaken. This group showed significantly greater increases on successive retestings with the Wechsler Memory Scale than the control group. Behavioural improvement occurred more often in the experimental than in the control group.

Although the total increases in the control group treated with the inert preparation were significantly less than those in the experimental group nevertheless, some improvement in memory and behaviour resulted. It would appear to point to the danger that psychiatric symptoms may too easily be assumed to result from totally irreversible organic processes in the senile patient rather than consider that some, at least, of these may be of reversible causation.

ACKNOWLEDGMENTS

First, we would like to thank Dr. G. J. Harrison, Medical Superintendent, Winwick Hospital, for permission to carry out this investigation.

To Dr. P. M. O'Flanagan and the nursing staff of the Geriatric Division we record our appreciation of the help given. Without the additional work and enthusiasm applied to this project by the nursing staff it would not have been possible.

We also acknowledge the help given by Vitamins Ltd. (London), who supplied both the active and the inert preparations for the trial.

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MEGALOBLASTIC ANAEMIA OCCURRING DURING TREATMENT OF EPILEPSY WITH PHENYTOIN SODIUM, PRIMIDONE AND PHENOBARBITONE

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It has now been established that megaloblastic anaemia may develop in patients receiving the anti-convulsant drugs phenytoin sodium ("Epanutin") and primidone ("Mysoline"), given alone or in combination with phenobarbitone (Girdwood and Lenman, 1956). Hobson *et al.* (1956) found 16 such cases described in the literature, and reported a case of their own in which megaloblastic anaemia developed in a patient addicted to a preparation ("Tuinal") containing equal parts of amylobarbitone sodium ("Sodium amytal") and quinalbarbitone sodium ("Seconal Sodium"), which are closely related chemically to primidone, sodium phenytoin and phenobarbitone. Characteristically the anaemia is not related to a deficiency of nor does it respond to treatment with vitamin B_{12}, nor is there achlorhydria, thus distinguishing it from true Addisonian pernicious anaemia. The condition however responds promptly to the administration of folic acid by mouth.

In view of these reports it was decided to investigate the incidence of megaloblastic anaemia due to anti-convulsant and sedative drugs occurring in a mental hospital population of over 2,000 patients. Laboratory records were searched for the 4-year period 1953–56 for all blood films which were reported as showing evidence of macrocytic anaemia. Patients' notes were then examined and those remaining in hospital submitted to further investigation.

MATERIAL

Records of 23 patients who were reported as suffering from a macrocytic type of anaemia were found and their clinical status correlated with sedative or anti-convulsant drug therapy intake. Of these patients 20 were excluded for the following reasons:

1. Four patients developed a macrocytic type of anaemia in the course of barbiturate medication, but there was insufficient haemotological evidence of the type of anaemia.
2. Four patients developed macrocytic anaemia of the pernicious anaemia type in the course of intercurrent physical disease: of these one suffered from diverticulitis, one from carcinoma of the stomach, and another developed anaemia following thyroidectomy. None of these three patients had received sedative medication. The fourth patient, an epileptic receiving phenytoin

sodium and phenobarbitone, developed megaloblastic anaemia following a fractured femur, which responded to treatment with folic acid, vitamin B_{12}, and omission of phenytoin sodium.

3. Eight patients were found to have suffered from true Addisonian pernicious anaemia, proved in some instances by complete achlorhydria and rapid response to injections of vitamin B_{12}. Three of these had received intermittent sedation with drugs of the barbiturate group, but in too small a dosage to be considered a factor in the development of their anaemia.
4. One patient receiving primidone and phenobarbitone developed a megaloblastic type of anaemia while under treatment with streptomycin for pulmonary tuberculosis.
5. Three patients developed megaloblastic anaemia—while being treated with phenobarbitone and phenytoin sodium (2); and primidone and phenobarbitone (1). Two had complete achlorhydria and responded to treatment with vitamin B_{12} by mouth while continuing on anti-convulsant therapy as before. They were therefore considered to have been suffering from true Addisonian pernicious anaemia. In the third patient, whose fractional test meal showed free acid in the 2½-hour sample only, primidone was stopped and she then responded to treatment by vitamin B_{12} injections.

The remaining 3 patients were considered to have been suffering from megaloblastic anaemia due to anti-convulsant and sedative drugs.

Case 1

A spinster, aged 29, was admitted in August, 1952 suffering from epileptic dementia. Since 1951 she had been receiving phenobarbitone gr. 1 t.d.s. with phenytoin sodium gr. 1½ b.d.; to which primidone 0·5 g. b.d. was added in hospital.

In June, 1954 blood investigation because of pallor showed Hb. 3·1 g. per 100 ml.; red cells 1 million per c.mm.; colour index 1·1; packed-cell volume 12 per cent.; leucocytes 2,000 per c.mm.; (lymphocytes 48 per cent.). Stained blood film showed marked macrocytosis, anisocytosis and poikilocytosis. Fractional test meal showed free acid in late samples, and tests for occult blood in stools were negative.

Primidone was omitted and she was treated with blood transfusion followed by folic acid and iron by mouth, and her blood picture returned to normal.

In February, 1956 she again presented with clinical anaemia. Red cells 1·6 million per c.mm.; Hb. 5·9 g. per 100 ml.; colour index 1·25; packed-cell volume 21 per cent.; mean corpuscular Hb. 36·3 γ ; mean corpuscular Hb. concentration 28 per cent.; leucocytes 3,000 per c.mm. (lymphocytes 50 per cent.). Van den Bergh reaction normal; serum bilirubin 0·9 mg. per 100 ml.; thymol turbidity 2+ units. Fractional test meal revealed free acid in the 2— and 2½-hour samples only; stained blood film again showed macrocytosis, anisocytosis and poikilocytosis.

One week later red cells had fallen to 1·2 million per c.mm.; Hb. 5·6 g. per 100 ml.; colour index 1·5; leucocytes 2,700 per c.mm. (lymphocytes 55 per cent.). Stained blood film continued to show macrocytosis, anisocytosis and poikilocytosis, and a few late normoblasts and megaloblasts were seen.

She developed a pyrexia and despite treatment by antibiotics and blood transfusion died one week later of broncho-pneumonia.

Case 2

A male, aged 25, who had suffered from Jacksonian epilepsy since the age of 2 was admitted January, 1956. He was then receiving primidone 0·5 g. and phenytoin sodium gr. 1½ b.d. At this time a blood investigation showed no abnormality. In May phenobarbitone sodium gr. 1 b.d. was added to his medication because of a succession of fits. Blood count in November showed red cells 2 million per c.mm.; Hb. 8 g. per 100 ml.; colour index 1·3; leucocytes 2,600 per c.mm. (lymphocytes 42 per cent.); platelets 100,000 per c.mm. Stained blood films showed marked macrocytosis, anisocytosis and poikilocytosis. Fractional test meal showed free acid in late samples only.

Phenytoin sodium and primidone were omitted and the dosage of phenobarbitone sodium increased to gr. 1½ t.d.s. He was treated with intravenous iron injections, vitamin B_{12} injections, and folic acid by mouth. Two weeks later sternal marrow puncture performed showed only massive erythropoiesis. Two months later his blood count had returned to normal.

Case 3

An epileptic spinster, aged 51, developed a megaloblastic type of anaemia after 4 years' treatment with phenytoin sodium gr. 1½ and phenobarbitone sodium gr. 1 b.d. In July, 1956 blood investigation showed red cells 1·1 million per c.mm.; Hb. 4·4 g. per 100 ml.; colour index 1·36; leucocytes 4,000 per c.mm. (lymphocytes 42 per cent.). Stained blood film showed marked macrocytosis, anisocytosis and poikilocytosis. Fractional test meal showed free acid in the 2- and 2½-hour samples only.

Phenytoin sodium was omitted and she was treated with blood transfusion, iron, vitamin B_{12} by injection and folic acid by mouth. Three months later her blood was normal in all respects.

DISCUSSION

Megaloblastic anaemia due to sedative and anti-convulsant drugs has been recognized since Badenoch (1954) described two epileptic patients who developed anaemia while under treatment with phenytoin sodium and phenobarbitone. Girdwood (1956) described the first case in which megaloblastic anaemia developed in the course of treatment with primidone and phenobarbitone. The anaemia belongs to the group of refractory megalocytic or achrestic anaemias which do not respond to liver or vitamin B_{12} therapy but respond promptly to folic acid by mouth or by injection. It is distinguished from true Addisonian pernicious anaemia by:

1. A history of drug ingestion.

2. The presence of free hydrochloric acid in the gastric juice although this may appear only in small amounts in the 2- and 2½-hour samples of a standard test meal.

3. In all cases in which the estimation has been made, serum vitamin B_{12} levels have been found to be normal (Girdwood and Lenman, 1956). Hence the condition does not respond to treatment with vitamin B_{12} but responds to treatment with folic acid or folinic acid. A few patients with megaloblastic anaemia do show some response to treatment with large doses of vitamin B_{12} (Mollin and Ross, 1954), although the reticulocyte count never rises higher than 4–5 per cent.

4. No neurological sequelae have yet been reported.

The cause of the condition is not fully elucidated. Girdwood and Lenman (1956) and Hobson *et al.* (1956) reported that there was no malabsorption of synthetic folic acid and suggested that the anaemia might be due to phenytoin sodium and primidone either alone or in combination with phenobarbitone acting in certain circumstances as competitive inhibitors of some enzyme system normally involving folic acid as a co-factor. Badenoch (1954) suggested that it might be a toxic effect because it is known that "barbiturates will inhibit maturation of red cells in marrow cultures *in vitro*".

Duration of drug ingestion has varied in the literature from 4½ months in the case of a patient who had been on barbiturates for an unspecified time to which primidone 750 mg. daily was added (Fuld and Moorhouse, 1956), to 6 months in the case of a female patient who received primidone 1 g. daily with phenobarbitone gr. 1 (Girdwood, 1956), to 13 years in the case of a patient of Hawkins and Meynell (1954), who had been receiving phenytoin sodium gr. 4½ only daily for 13 years.

The average duration of drug taking before the discovery of the first symptoms of anaemia was 3–4 years in most of the reported cases, which coincides with our observations. Presenting symptoms are those of a severe anaemia with at times stomatitis, glossitis, and in one of our patients, rectal bleeding.

The condition may be difficult to distinguish in retrospect from true Addisonian pernicious anaemia if anti-convulsant drugs are withdrawn and the patient—in whom achlorhydria may be an adventitious finding—then improves with injections of liver or vitamin B_{12}. When these drugs are withdrawn patients may be expected to recover spontaneously, as happened in some of the patients excluded from this series and in a patient reported by Webster (1954). The picture may be further complicated by the development of Addisonian-like anaemia in epileptics with intercurrent disease.

The onset of the anaemia may be rapid: in 2 of our patients under observation in hospital the haemoglobin had fallen to 30 per cent. or less before they came under notice. The seriousness of the condition is shown by the fact that one of them died two weeks after the onset of a second attack.

Reports in the literature suggest that it is perhaps not always necessary to omit phenytoin sodium or primidone during treatment with folic acid (Chalmers and Boheimer, 1954; Berlyne *et al.*, 1955), although this has been the usual course followed, patients being maintained on phenobarbitone only. A patient reported by Rhind and Varadi (1954) remained well on a small maintenance dose of 5 mg. of folic acid while continuing with phenytoin sodium and phenobarbitone after her anaemia had been treated.

SUMMARY

Three epileptic patients are reported in whom megaloblastic anaemia developed during treatment with phenytoin sodium, primidone and phenobarbitone. One died before the condition was recognized. The condition responds promptly to treatment with folic acid by mouth.

ACKNOWLEDGMENT

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THE EFFECTS OF PACATAL ON CHRONIC MENTAL ILLNESS

By

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Pacatal is one of the newer so-called tranquillizing drugs. It is a synthetic phenothiazine derivative—N-methyl-piperidyl-(3)-methylphenothiazine which was first investigated in Germany in 1954. It has the same basic structure as chlorpromazine but a different side chain.

It is claimed that Pacatal is a powerful tranquillizing drug for the symptomatic relief of emotional and mental disturbances characterized by anxiety, restlessness, excitement and disturbed behaviour, ranging from the psychoneuroses to the psychoses. It is said in addition that it does not upset appreciably the proper balance between the two divisions of the autonomic nervous system and that it is remarkably free from troublesome side effects. The purpose of this trial was to investigate these claims.

Material and Method

Fifty patients (25 males and 25 females) were given Pacatal orally. They were all suffering from long-standing mental illness and their present stay in hospital ranged from 1 to 36 years with an average of 12 years. The average age was 46·3 years. Forty-four suffered from schizophrenia, 2 were mental defectives with a superimposed schizophrenia, 1 was a schizoid psychopath, 1 an epileptic idiot, and 2 were chronic depressives. The majority had previously had some form of physical treatment including six on whom pre-frontal leucotomy had been performed. In view of the long duration of their illnesses, the patients were considered a control in themselves. Moreover, practically the whole of the group had previously been on a carefully controlled investigation with other drugs with no significant benefit. The investigation can be considered in four stages. In the first, the patients were given Pacatal in a dosage varying from 150 mg. to 300 mg. daily for a period of 6 weeks. In stage 2 the patients were given Pacatal 75 to 150 mg. daily and chlorpromazine 75 mg. to 150 mg. daily for 4 weeks, as Canadian workers claimed that this combination produced a greater clinical effect than either drug alone, and that the two drugs seemed to cancel out each other's side effects (1). In the third stage chlorpromazine 75 mg. to 150 mg. daily was combined with a placebo identical in appearance to the Pacatal tablet for 8 weeks. Finally, Pacatal alone was again administered in a dosage up to 450 mg. daily for 5 weeks.

Table I

General Results from Treatment

	Female	Male	Total
Much worse	0	0	0 (0%)
Worse	0	2	2 (4%)
No change	8	16	24 (48%)
Better	14	3	17 (34%)
Much better	3	4	7 (14%)

Table I summarizes the results of the treatment. "Better" was not assessed unless there was a significant improvement. "Much Better" was taken to be a marked improvement both in symptoms and social potentiality.

Only one patient was discharged. This was a chronic depressive who left after being on treatment for two months "Much improved". He has now been in employment for four months during which time he has not been on any medication and his improvement is being maintained. The other chronic depressive became worse, being generally slower, more retarded and somewhat drowsy. He improved on chlorpromazine plus the placebo and again deteriorated when Pacatal was resumed. He has slowly improved since Pacatal was stopped.

Two deaths occurred in the course of the trial, but they were not unexpected and were not due to Pacatal, although it is considered that the effects of the drug as a contributory factor cannot be entirely excluded. One, a woman, age 68, had been on 150 mg. of Pacatal daily for six weeks and had shown a very marked mental improvement with complete disappearance of symptoms which included delusions, hallucinations, tension and anxiety. She then developed a temperature and was found to have a *B. coli* urinary infection. The drug was stopped and the pyelitis responded to antibiotics, but she died 17 days after Pacatal was stopped. The cause of death ascertained by post-mortem was (1) Acute congestive heart failure, (2) Myocardial degeneration, (3) Coronary atherosclerosis. Eight days after stopping Pacatal, she developed an adenitis of the submandibular salivary glands, which may well have been connected with the decreased salivation produced by the drug. The other death was in a male, age 48, a mental defective with superimposed schizophrenia in poor physical condition at the onset of treatment who required every nursing attention. He received Pacatal 150 mg. daily for 6 weeks, Pacatal 75 mg. and chlorpromazine 75 mg. for 4 weeks, chlorpromazine 150 mg. daily for 5 weeks, and finally Pacatal 300 mg. daily for 8 days. His physical condition continued to deteriorate slowly during the investigation and all drugs were eventually stopped. The physical deterioration continued and he died 19 days after Pacatal was stopped. The cause of death ascertained by post-mortem was (1) Acute congestive heart failure, (2) Myocardial degeneration, (3) Schizophrenia. There were no findings suggestive of agranulocytosis in either necropsy.

TABLE II

Analysis of Effects of Treatment on Certain Signs and Symptoms

(Percentage in parentheses)

Symptoms and Signs	Present at Outset			Improved		
	Female	Male	Total	Female	Male	Total
Tension	4	10	14	3	2	5
Aggression	23	6	29	18	2	20 (69)
Delusions	22	16	38	6	5	11 (36)
Hallucinations	20	15	35	6	7	13 (37)
Retardation and Withdrawal ..	4	19	23	4	5	9 (39)
Overactivity	8	3	11	4	1	5 (45)
Depression	4	14	18	3	4	7 (39)
Elation	2	1	3	1	1	2
Confusion	17	12	29	5	5	10 (35)
Impulsiveness	19	6	25	14	1	15 (60)

Table II shows the effects of the treatment on certain symptoms and signs. The most striking improvement was in "aggression" (69 per cent.), "impulsiveness" (60 per cent.), and to a lesser extent, "overactivity" (45 per cent.). It will be seen that the female group by random selection contained a much higher proportion of these three symptoms and signs than the male group, and Table I shows that the general results of the treatment were much better for the female group than for the male—a total of 17 (68 per cent.) improved as against 7 (28 per cent.).

The Sister in charge of the female ward which provided 14 of the most disturbed patients for the investigation felt that the overall picture was a quieter ward with an increase in interest, initiative and occupational capacity.

There was no significant difference in the effects of Pacatal alone and Pacatal and chlorpromazine. Three patients seemed to be better on the combined medication. Four patients showed a minimal deterioration on chlorpromazine and placebo, the others maintaining their improvement. Seventeen of the twenty-four patients who improved had relapsed or were relapsing four weeks after all treatment was stopped, the majority having already returned to the condition they were in prior to treatment.

There was an average loss in weight of 2·5 lbs. during treatment. Systolic blood pressure dropped an average of 9·0 mm., whilst diastolic rose by an average of 3·0 mm., and the pulse rate average increased by 9.

TOXIC AND SIDE EFFECTS

Mention has already been made of the two deaths in the course of treatment. A summary of the more common side effects is shown.

TABLE III

Side Effects from Pacatal

Signs and Symptoms	Cases
Dryness of mouth	25
Blurring of vision	9
Unsteadiness and loss of balance	7
Drowsiness	3
Dizziness	2
Recurrent vomiting	2

Dryness of the mouth, which was by far the commonest side effect, persisted throughout the treatment in 10 cases. It has recently been claimed that this symptom can be alleviated by reserpine (1–2 mg. daily), which increases salivation. Visual disturbances due to failure or difficulty in accommodation, occurred in 9 cases and were persistent in 2. Eserine drops (1 per cent.) are said to be efficacious in controlling this effect, but were not employed in this series. The unsteadiness and loss of balance occurred with the higher doses and usually disappeared on lowering the dose. Two patients who had this unsteadiness also displayed a shuffling gait, absence of associated movements and impoverishment of emotional expression. One in addition had a coarse tremor. The picture was one of incipient Parkinsonism. These symptoms disappeared also on adjusting the dosage. Troublesome constipation was avoided in all but one instance by the routine administration of a laxative twice weekly throughout the treatment. No case of jaundice occurred. There was no suspicion of agranulocytosis, although a case of this occurring with Pacatal has recently been reported in the *Lancet* (2). No allergic reactions were seen and there was no instance of contact dermatitis in those handling the drug, a point of considerable practical importance.

DISCUSSION

New tranquillizing drugs are appearing on the market with increasing frequency and, for the majority, extravagant claims are made. I feel strongly that these drugs should not be circularized to general practitioners and made available on prescription until they have been more extensively investigated by controlled trials in hospital. It is therefore most important that the results of these studies should be published for the further guidance of practitioners who may be tempted to use tranquillizers prematurely. The need for this safeguard is well illustrated in the case of reserpine which was made available for general use before it was realized that it could precipitate depressive states, in some instances with suicidal tendencies.

In my opinion, Pacatal has a definite place in the treatment of the chronic psychotic, and seems to be particularly effective where aggression, impulsiveness or over-activity are prominent. It is not an hypnotic. Drowsiness appears in only a very small proportion of cases, and can be diminished by giving a smaller dose. On the contrary, the patients who benefited from the treatment showed more interest and initiative and a greater desire to occupy themselves.

I have no extensive experience of Pacatal in the treatment of neurosis, but have tried it in a few cases. None was improved and the troublesome side effects of dryness of the mouth and blurring of vision almost invariably increased the anxiety in spite of repeated reassurance.

SUMMARY AND CONCLUSIONS

1. Pacatal, a new tranquillizing drug, was administered to 50 chronic psychotic patients, alone and combined with chlorpromazine. The results are described.

2. 48 per cent. of the patients benefited from the drug.

3. The combination of Pacatal and chlorpromazine was not found to be any more effective than Pacatal alone.

4. Pacatal would seem to be particularly indicated for aggression, impulsiveness and over-activity.

5. The effect is not maintained when Pacatal is stopped, and it is considered that the drug will probably have to be maintained indefinitely although in time a smaller maintenance dose could possibly be achieved.

6. The patients who were treated comprised the worst possible material and the promising results obtained suggest that Pacatal is worthy of further investigation both in chronic and acute psychoses.

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INDOLE EXCRETION PATTERNS DURING TREATMENT WITH RESERPINE

By

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Reserpine was first used extensively in psychiatric practice in the U.S.A. where many favourable reports on its use were published in 1954 and 1955 (Kline, 1954; Hollister *et al.*, 1955; Kline and Stanley, 1955). Subsequently a series of reports appeared in the U.K. (Foote, 1955; Davies and Shepherd, 1955; Shepherd and Watt, 1955). These reports were more critical and sought to establish more precise indications for the use of the drug. It soon became apparent that the drug was of most value in schizophrenia and the organic hyperkinetic states. The value of reserpine in psychoneuroses is limited (Folkson and May, 1955) but that it is going to have a more than temporary place in the treatment of schizophrenia is suggested by the continued appearance of favourable reports (Moore and Martin, 1957). These last authors emphasize that not only is the drug an effective sedative but also that it does appear, in some places, to induce genuine remissions. The present difficulty is to predict which patients will respond in this way.

Meanwhile the physiologists and pharmacologists have shown an equivalent interest in reserpine (Shaw and Woolley, 1953; Gaddum, 1953; Shore *et al.*, 1955). The interesting fact emerging from the researches of these and many other workers is that reserpine appears to release serotonin (5-hydroxy-tryptamine) in the body. It has been suggested that the central action of reserpine is mediated through such a mechanism, the serotonin which is normally in a bound form being liberated from the brain cells by the action of the reserpine (Brodie *et al.*, 1955). Shore *et al.* (1955) were able to show a quantitative increase in the urinary excretion of 5-hydroxy-indole-acetic acid, a breakdown product of serotonin, in dogs following the administration of massive doses of reserpine. The response was maximal at 4 hours and had returned to the base-line by 8 hours. Meanwhile the same authors had shown that serotonin potentiates the hypnotic action of hexobarbital on mice and that this effect was antagonized by lysergic acid diethylamide, a potent hallucinogen.

The investigation reported here consisted of a controlled clinical trial of reserpine linked with serial examination of the urinary indole excretion patterns in twelve chronic schizophrenic patients.

MATERIALS AND METHODS

The criteria for admission to the trial were that the diagnosis must be schizophrenia, that the illness be of long standing and that the patients be sufficiently co-operative to take the tablets prescribed. For convenience the twelve patients were selected from one ward and this determined that they were of the same sex, female. The mean age was 38·9 years and the range 35 to 46 years. The mean length of illness was 13·8 years and the range 4½ to 28 years. The diagnoses were Hebephrenia (10 cases), Paranoid Schizophrenia

(1 case) and Catatonic Schizophrenia (1 case). Both these latter cases had previously been subjected to prefrontal leucotomy. Of the twelve patients five had had previous E.C.T. and six had had previous treatment with reserpine. All drugs were discontinued four weeks before the trial commenced. The trial was run on the double blind principle. The pharmacist made up two bottles containing reserpine (1 mg.) and identical placebo tablets. The bottles were labelled PQR and XYZ and the pharmacist kept the key. The patients were then allocated PQR or XYZ (tablets 1 t.d.s.) using a series of random numbers (obtained from the tables in Bradford Hill's "Medical Statistics"). After six weeks all drugs were withheld for seven days and were then re-introduced for a period of four weeks with the order reversed and the dosage doubled (tablets 2 t.d.s.).

Methods of Assessment

The patients were examined physically and interviewed prior to the trial. It should be emphasized that they were all in a relatively "non-productive" stage of their illness and were not very informative at interview. In six patients an attempt was made using I/V sodium amytal to get further information about their mental content. This attempt was not, however, attended by any degree of success. Nevertheless an assessment of the mental state of each patient was made by the author (A.F.) before the trial began. The other observers were the ward sister (M.R.) and the senior occupational therapist (H.M.). The patients were well known to them and they were asked to make a base-line assessment of the patients' behaviour in the two weeks before the trial commenced. At the end of six weeks each observer had to record whether each patient was much improved, improved, the same or worse (+2 to −1). The criteria were those of behaviour in the observed situation, i.e. ward, O.T. Department or interview. This assessment recorded any change compared with the pre-trial base-line. A second assessment at eleven weeks recorded any change as compared with the six weeks level.

Investigations

Each week samples of urine from each patient were examined starting two weeks before the trial and continuing throughout the eleven weeks of the trial. The urine was examined for indoles using a two-way ascending chromatographic technique based on that described by Jepson (1955). The solvent for the first run was isopropanol–ammonia and the papers were held in an aluminium frame (supplied by Shandon Ltd.). Whatman No. 4 paper was used and the run was continued for about 8 hours. The papers were then dried (using a hair-dryer), the frame rotated through 90 degrees and the second run, using butanol-acetic acid, continued for about 7 hours. They were then dried and developed using an Ehrlich hydrochloric-acid-acetone dip. Spots were outlined in pencil as they appeared and numbered in order of appearance. Confirmatory tests for serotonin (5-H.T.), 5-hydroxy-acetic acid (5-H.I.A.A.) and indole-acetic acid (I.A.S.) were the same as those suggested by Jepson. With each batch of papers a standard solution containing serotonin, creatinine sulphate, tryptamine, urea and tryptophane (of each 1 mg./ml.) was "run" for location purposes. The only difference between the technique employed in this investigation and that advocated by Jepson was that the papers were smaller (20 by 20 cm.). This gave shorter "runs" which was convenient but resulted in a lesser degree of separation of the "spots". In fact examinations using larger (12 in. × 12 in.) and "slower" papers (No. 20 Whatman paper) have been performed on all the patients at various times during the trial. The "spots" using this latter technique were better defined and more clearly separated but were not different as regards their relative positions.

OTHER MEASUREMENTS

The patients were weighed at the start of the trial and then at weekly intervals. Their blood pressure was recorded at the start of the trial (mean of two readings in the supine position), at six weeks and at the end of the trial. The weights were known to M.R. but not to A.F. and vice-versa for the blood pressure readings. It was recognized that this information might bias these two observers but it was not found practicable to involve yet another observer.

RESULTS

Clinical Trial: The ratings given by the three observers at six and eleven weeks were summed and are shown in Table I (maximum score +6, minimum score —3).

TABLE I

Comparison of Placebo With Drug Period for Each Patient

Patient	First Period of 6 Weeks		Second Period of 4 Weeks	
	Medication	End Rating	Medication	End Rating
E.B. ..	Placebo	0	Reserpine	+1
A.B. ..	Reserpine	+2	Placeho	+1
M.C. ..	Reserpine	+2	Placebo	—5
C.C. ..	Reserpine	+1	Placebo	+1
R.D. ..	Placebo	0	Reserpine	0
M.G. ..	Placebo	+1	Reserpine	+2
G.H. ..	Reserpine	0	Placebo	0
J.K. ..	Placebo	+2	Reserpine	+1
M.L. ..	Placebo	0	Reserpine	+2
M.M. ..	Reserpine	+3	Placebo	0
M.McD. ..	Placebo	0	Reserpine	+2
I.M. ..	Reserpine	+3	Placebo	+1

It should be noted here that one patient (M.C.) had to be withdrawn from the trial during the 9th week on account of disturbed behaviour. Her ratings have been included in Table I as the deterioration during the second part had been matched by a very noticeable improvement during the first part. The mean scores for the drug periods and placebo periods are shown in Table II; the difference between these scores is thought to be significant.

However it should be noted that when the number of patients improving on placebo and reserpine are compared the difference is not significant ($\chi^2=1\cdot45$ P 0·3 0·2).

TABLE II

No. of Patients	Drug or Placebo	Mean Score	Per cent. of Maximum Score
12	Drug	+1·7	26·4
12	Placebo	+0·08	1·39

The blood pressure readings have not been included in Table III as they are not thought to be significant; the differences noted were of the order of ±20 mm. systolic and ±10 mm. diastolic pressure. One point of interest was that five patients showed a rise of blood pressure after their period on reserpine (mean rise: 14 mm. systolic, 7 mm. diastolic). The weight changes are shown in Table III.

TABLE III

Weight Changes on Placebo and Reserpine

Patient	Placebo		Reserpine	
	Initial Weight	Change in Weight	Change in Weight	Final Weight
B.B. ..	8 st. 4 lbs.	+4 lbs.	+6 lbs.	9 st. 0 lbs.
A.B. ..	7 st. 5 lbs.	−4 lbs.	+9 lbs.	7 st. 10 lbs.
M.C. ..	8 st. 7 lbs.	−4 lbs.	0 lbs.	8 st. 3 lbs.
C.C. ..	10 st. 0 lbs.	−1 lbs.	+5 lbs.	10 st. 4 lbs.
R.D. ..	7 st. 0 lbs.	+4 lbs.	0 lbs.	7 st. 4 lbs.
M.G. ..	7 st. 3 lbs.	+3 lbs.	+5 lbs.	7 st. 11 lbs.
G.H. ..	9 st. 7 lbs.	−3 lbs.	+7 lbs.	9 st. 11 lbs.
J.K. ..	7 st. 6 lbs.	+3 lbs.	0 lbs.	7 st. 9 lbs.
M.L. ..	7 st. 5 lbs.	+3 lbs.	+3 lbs.	7 st. 11 lbs.
M.M. ..	8 st. 10 lbs.	+2 lbs.	+12 lbs.	9 st. 10 lbs.
M.McD. ..	9 st. 0 lbs.	+2 lbs.	+4 lbs.	9 st. 6 lbs.
I.M. ..	8 st. 0 lbs.	−3 lbs.	+7 lbs.	8 st. 4 lbs.

The results of the chromatographic studies are shown in Table IV. Urea, tryptophane and indoxyl sulphate were present in all urines and have not been included in the table. Similarly indole acetic acid and indole lactic acid were found in some of the urines but for the sake of simplicity of presentation these also have been left out of the table. The technique employed is essentially qualitative and the results have therefore been tabulated as absent (—), trace (±) and present (+). The results for serotonin (5-hydroxytryptamine) and 5-hydroxy-indole-acetic acid, using this method of scoring, are shown in Table IV; the findings for the twelve patients over a period of 13 weeks have been recorded. There are some blanks and these are due to unavoidable difficulties in collecting the urine samples.

TABLE IV

Indole Excretion During Reserpine and Placebo Periods

Patient			Placebo							Reserpine				Indoles
	1	2	3	4	5	6	7	8	9	10	11	12	13	
						(Time in Weeks)								
E.B. ..		—	—	—	+	+	—	+	+	—		—	—	5-H.I.A.A.
		+	—	—	±	±	—	—	±	—		—	—	5-H.T.
R.D. ..	—	+	+	—	+	—	+	+	+	—	—	—	—	5-H.I.A.A.
	—	+	—	+	+	+	+	+	+	+	—	+	+	5-H.T.
M.G. ..		—	—	—	—	—	—	—	—	—	—	—	—	5-H.I.A.A.
		—	+	+	+	±	±	—	+	+	+	±	±	5-H.T.
J.K. ..		—	—	—	+	—	+	+	+		—	—	—	5-H.I.A.A.
		+	+	+	+	+	+	+	+		—	+	±	5-H.T.
M.L. ..	—	—	—	—	—	+	—	+	+	—	—	—	—	5-H.I.A.A.
	+	—	+	+	+	+	+	+	+	—	—	±	±	5-H.T.
M.McD.	—	+	+	—	—	+	+	+	—	—	—	—	—	5-H.I.A.A.
	+	+	+	+	±	+	+	+	+	+	—	±	+	5-H.T.

TABLE IV—*continued*

Patient			Reserpine							Placebo				Indoles
	1	2	3	4	5	6	7	8	9	10	11	12	13	
						(Time in Weeks)								
A.B. ..	+	−	−	−	−	−	−	−	+	−	−	−	+	5-H.I.A.A.
	−	+	+	+	+	+	+	+	+	+	+	+	+	5-H.T.
M.C. ..	−	−	+	−	−	−	−	+	+					5-H.I.A.A.
	−	+	+	+	+	±	+	+	+					5-H.T.
C.C. ..	−	−	−	−	−	−	−	+	−	−	−	−	−	5-H.I.A.A.
	+	+	−	−	+	+	+	±	+	+	−	+	+	5-H.T.
G.H. ..	−	−	−	−	−	−	−	−	+	−	−	−	−	5-H.I.A.A.
	−	−	−	−	−	−	−	−	−	−	−	−	+	5-H.T.
M.M. ..	−	−		−	−	−	+	+	+	−	+			5-H.I.A.A.
	+	+		−	±	±	±	±	±	+	+			5-H.T.
I.M. ..	−	−	+	−	−	−	−	+	+	+	−	−	−	5-H.I.A.A.
	+	+	+	+	±	±	+	−	+	+	−	+	+	5-H.T.

DISCUSSION

This clinical trial of reserpine in chronic schizophrenic patients confirms the work of other workers such as Wing (1956) and Moore and Martin (1957) that the drug is of real value in this illness. It is perhaps worth emphasizing that the twelve patients reside in an active ward where they are not permitted to "deteriorate" in a psychiatric sense. They were all in a "non-productive" phase of their illness and seldom required sedatives with the exception of patients G.H. and C.M. The former has hostile outbursts from time to time while the latter had constantly tried to escape in her disturbed phases. In view of these factors the improvement was particularly impressive. Although this trial was technically a "controlled" trial, yet the ward sister (M.R.) was able, during the second part of the trial, to forecast which patients were on placebo and which were on reserpine. She based her forecast on their appetites and on their behaviour but did not impart her knowledge to the other observers. When the key was opened she was proved to be correct. Another point worth stressing is that comparing the post-trial with the pre-trial period eleven patients showed gain in weight and eleven patients showed some degree of improvement in their mental state, though in some cases the improvement was not of sufficient magnitude to warrant a plus rating. This only confirms what is already recognized in mental hospital work, that the interest aroused by a drug trial is good for the staff and therefore good for the patients (Houston, 1956; Wing, 1956).

The results of the investigation into urinary indole excretion patterns are difficult to interpret. The normal range of excretion of serotonin is still undecided, differing figures being reported by Rodnight (1956), Boyland *et al.* (1956) and Haverback *et al.* (1956). The last authors also examined the urine from four schizophrenic patients and found 5-H.I.A.A. in amounts similar to that for the normals (the range was 2·2 to 6·7 mg./24 hours). As part of another investigation carried out in this hospital urine from sixty medical patients has been examined using the same technique. Serotonin was detected in 20 patients (33·3 per cent.). Urine from thirty schizophrenic patients has similarly been examined and serotonin was detected in 22 cases (73·3 per cent.). Clearly further work on this subject is required before any inferences can be drawn. However, the known effect of reserpine on brain and platelet serotonin suggested that the administration of reserpine would be associated with changes in the indole excretion pattern and the absence of any such correlation in this present investigation was unexpected. Admittedly the dose was small; Shore *et al.* (1955) in their experiments on dogs used 3 mg./kilo body weight. Also early morning urine samples were examined in this investigation as opposed to 24-hour samples; the reason for this was simply the difficulty of collecting 24-hour specimens from schizophrenic patients who are up and about. In fact this negative observation confirms that made by Haverback *et al.* (1956) regarding 5-H.I.A.A. They examined the urine of six patients before and after reserpine (1–6 mg. daily) using a quantitative test. The differences in the amounts of 5-H.I.A.A. excreted were not significant. These authors point out that the largest depot of serotonin in the body lies in the gastro-intestinal tract and that while reserpine has been shown to lower the brain and platelet serotonin content, it has (in therapeutic doses) little effect on the gastro-intestinal depot. They go on to argue that therefore there may well be changes in brain serotonin content without changes in urinary excretion of 5-H.I.A.A. It may be that further complicating factors are the time relationships involved. Thus Shore *et al.* (1955) found in their dogs that the maximum rise in excretion of 5-H.I.A.A. was at 2–4 hours and that the excretion had returned to normal by 8 hours. This might well happen in human subjects given comparably large doses, but even then it would be difficult to correlate that with the accepted fact that the effects of reserpine (as regards the mental state) do not appear for several days. Another point of interest arising from this investigation was that serotonin was more commonly detected in the urine than 5-H.I.A.A. It seems to have been accepted in the various reports in the literature that 5-H.I.A.A. is the normal excretion product of serotonin. This was not found to be the case in the twelve schizophrenic patients investigated in this trial.

Conclusions

1. A controlled trial of reserpine in 12 (female) schizophrenic patients revealed a significantly greater improvement during the period when the patients were receiving reserpine.

2. These results have been discussed in relation to the non-specific effects resulting from the enthusiasm engendered by the trial itself.

3. The urinary indoles excreted by these 12 patients were examined weekly during the trial, using a paper chromatographic technique. There was no correlation found between the administration of reserpine and the excretion of serotonin or 5-hydroxy-indole-acetic acid. These results have been discussed in relation to present knowledge regarding the range of excretion of these indoles in "normal" and schizophrenic subjects.

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THE INFORMATION CAPACITY OF YOUNG MENTAL DEFECTIVES IN AN ASSEMBLY TASK*

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I. INTRODUCTION

IT is the aim of this paper to present some ideas for a new and practical approach to some of the problems of assessment and placing of mental defectives with respect to motor abilities. Attention will be drawn to some theoretical confusion about the relationship between mental and motor abilities in the mentally deficient population and finally some experiments illustrating the possibility of a new approach will be described.

Most readers will be familiar with the work of Muscio (1922), Perrin (1921), Earle and Gaw (1930) and Seashore (1940), on the relationship between mental and motor abilities. It is difficult to avoid the general conclusion that motor tests do not correlate very well among themselves and hence any supposed motor ability cannot be shown to have any precise relationship with intelligence. Experience with defectives reveals that the imbecile is clumsy in gait and slow in manipulation and that a feeble-minded boy may be ten years old before he can tie his shoe-laces. There is, then, a clear conflict between the conception of a general motor ability which is uncorrelated with intelligence and the observation that a population whom we know to be of subnormal intelligence shows a concomitant motor deficiency.

Some psychologists accept this situation as a puzzle. As recently as 1950 Cassel referred to the relationship between mental and motor abilities as "an unsolved problem of long standing". Cantor and Stacey (1951) refer to "the questionable relationship between intelligence and dexterity". Since the early studies, such as that of Kuhlmann (1904) many experimenters using a wide range of tasks have found deficiencies in the motor performance of mental defectives. In a recent experimental survey Tizard, O'Connor and Crawford (1950) used a battery of intelligence and motor tests on 104 consecutive male admissions over sixteen years of age. This rules out many of the imbeciles who are often admitted at a younger age, thus the sample is of relatively high-grade patients. The results suggest that many so-called defectives are deficient only in verbal ability but may have high or low practical ability. However differences were apparent in tests involving co-ordination and precision in which defectives are worse than in tasks involving form and space perception. Van Der Lugt (1943) using over 2,000 Dutch children in a standardization of her Psychomotor Scale found a negative correlation between intellectual and motor ability in intellectually superior subjects, a strong positive correlation for feeble-minded subjects and a zero correlation for normal subjects. These findings suggest the possibility of some relationship which at its simplest would be non-linear. It is clear that techniques employing traditional categories would require careful and extensive sampling to map the relationships which might hold with the intellectually subnormal population. The most that can be said on the available evidence is that the absence of a general motor ability comparable in form to mental ability in the normal population does not contradict evidence that subjects of low intelligence tend to perform badly on the motor tasks. Any confusion which may be said to exist is certainly methodological. Traditional methods based on measuring the difference between normals and defectives along a continuum might lead to the puzzle that whilst we are not at all sure that normals exhibit something called motor ability we do feel sure that defectives have less of it.

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II. A New Approach

The difficulty of attempting to define a motor ability comparable to mental ability is in part due to the problem of finding the appropriate categories. As measured performance on a number of tasks shows poor inter-correlations it may be suggested that the accepted task classifications do not provide adequate categories. Even if satisfactory factors did emerge predictive validation would still be difficult for jobs would have to be assessed according to the amount of "dexterity", "co-ordination" or "asynkinaesia" involved. The categories of intelligence are never really validated against more stringent criteria than examination success but tests of motor abilities to be of any practical use would have to be validated in terms of successful prediction with relation to a known job or group of jobs. In order to do this more must be known about what a task in fact involves. The following suggestions are a contribution to this aim.

R. H. Seashore (1951) has remarked that research on motor ability has to a large extent ignored Time and Motion Study. As a starting point the movement elements (*Therbligs*) may be categories of some value in giving a first approximation to what a job involves. There are important variables operating within these elements for it is clear that a given element will not involve a constant time for its accomplishment nor a constant amount of difficulty. Variables such as the amplitude of the movement and its required accuracy must be taken into consideration. Methods-Time Measurement as described by Maynard, Stegemerten and Schwab (1948) is an attempt to predict the time a normal operator will take on a job involving certain elements under a variety of conditions. It has been found that with normal operators reasonably accurate predictions can be made. Thus a job may be analysed and a time standard set without the necessity of a Time and Motion Study on a skilled operator. Methods-Time Measurement implies a normal operator but it is cogent to investigate the properties of subnormal operators. The within-element variables such as amplitude, tolerance and degrees of equivocation in the task may have particular importance for the subnormal operator. Recently attempts have been made to subsume these within-element variables under a single measurable quantity, the Information Load. Fitts (1954) has demonstrated that with normal operators it is possible to predict the time taken for a movement element by an assessment of the Information Load. The time taken to complete an element is proportional to the Information Load, a quantity derivable from objective measures of the task such as the amplitude and the tolerance. This quantity is roughly equivalent to task difficulty but has the advantage of being objectively definable. Fitts has demonstrated that with a range of tasks a constant rate of gain of information is found in normal subjects. Thus the assessment of the Information Load of a task and the known Information Capacity of a subject or group of subjects would enable either the prediction of the time necessary to do the task or, if the task is paced, whether the subject is capable of doing it, that is whether he is capable of handling the necessary amount of Information in the required time. If it can be shown that mental defectives differ from the normal population with respect to Information Capacity and if industrial and other tasks may be assessed in terms of their Information Load then the allocation of patients to jobs would be much facilitated.

Recent work on the employability of defectives such as that of Tizard and O'Connor (1950) and Clarke and Hermelein (1955) has demonstrated the point that defectives, even in the imbecile range, may successfully undertake a much wider range of task of an industrial nature than had hitherto been thought possible. The need for some kind of systematic assessment of both the jobs and the patients is increasing and it is therefore suggested that the matching of jobs in terms of Information Load with patients in terms of their Information Capacity would be a technique of the utmost practical value. The experiment which follows is a first attempt to find out whether defectives are inferior with respect to Information Capacity, and if their motor performance is at all comparable to the performance of a communication channel.

III. Experiment (*i*). Apparatus and Procedure

The general aim was to take a simple task such as defectives might perform in a Sheltered Workshop and to analyse the performance of patients with varying degrees of intellectual impairment. The hypothesis is that performance would vary with the Information Load on an element and that patients would differ with respect to Information Capacity. Increases in the Information Load would lead to poorer performance and if defectives may be considered as inferior Information handling systems any increase in the Information Load of a task would tend to affect performance to a greater extent than with normals.

An assembly task was found to be convenient. The subject is faced with an array of Braillet Pegs standing upright in a board and has to transfer them, one by one, to a row of holes four inches away. The task is easily divisible into four motion elements, "Reach", "Grasp", "Carry", and "Assemble". These are four of the most common movement elements and might form a basis of any number of small tasks.

The accurate measurement of these elements is easily achieved with the use of a relay unit. A sub-threshold current is passed through the subject such that when he touches a peg in the display he completes a circuit and a relay closes. As he lifts the peg a circuit is broken and the relay opens. Contact with the row of holes makes another circuit which is again broken when the hand moves away on the next element. The times were recorded on a drum at 50 mm. per second. In this experiment one element, Reach, was varied with respect to Information Load. The array contained black and white pegs and the subjects were instructed to select only the white pegs. In the first condition there were only white pegs, thus no choice was involved in the selection. In the second condition there were two rows of pegs with black and white mixed so that for each cycle one peg had to be selected from a choice of two. The third and fourth conditions involved choices of one in four and one in eight respectively. The degree of choice in the four conditions of Reach may be dealt with in terms of Information Theory. The amount of information needed to resolve the uncertainty in the task, that is which peg to grasp, is the number of one in two choices which would be needed. Thus to select one peg from two requires one bit, to select one from four requires two bits and one from eight requires three bits. The conditions B, C, and D each add one further bit of information to the Reach element. It should be clear that the information in this sense does not refer directly to the instructions given verbally to the subject but to the number of alternatives from which he must choose to select correctly the peg.

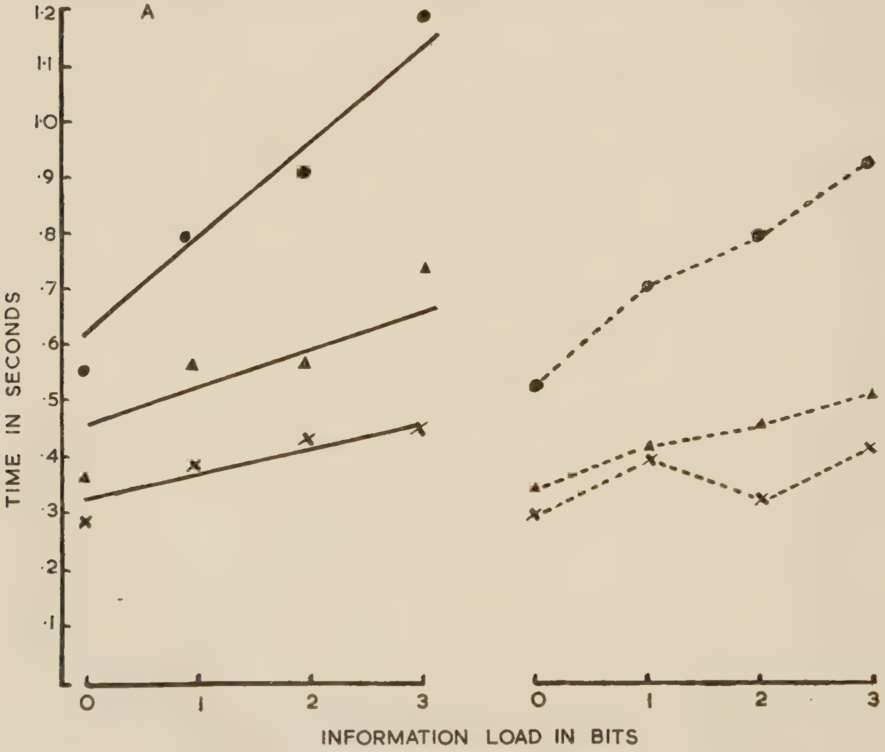
The subjects were 72 male defectives aged between 16 and 21 years from two large mental deficiency institutions and an Occupation Centre in Bristol. They were graded on the basis of verbal intelligence into three groups of twenty-four, High Grades with I.Q.s of 60 and over, Middle Grades with I.Q.s of 40–59 and Low Grades with I.Q.s of below 40. All the subjects were given the task in all four conditions. The twenty-four subjects in each group doing the four conditions each in one of the twenty-four orders of presentation. A record of sixteen cycles of operation in each of the four conditions was taken. The instructions were simply to take out all the white pegs one by one beginning at one side of the board and working across to the other. The experimenter illustrated these instructions by performing the operation at the same time. None of the subjects failed to understand what was expected of him.

IV. Results of Experiment (*i*)

The main result is clearly shown in Tables IA and IB giving mean and median times for the three groups. The Reach element varied through four

Table IA

Mean Times and Regressions of Time on Information for three Groups of 24 Subjects in the Peg-Board Task. Median Times for the Same Subjects in the Same Task



Key: × = High Grades; ▲ = Mid Grades; ● = Low Grades.

Table IB

Reach Element. Time in Seconds

	0 Bits	1 Bit	2 Bits	3 Bits
Low Grades:				
Median	·533	·676	·763	·918
Mean	·544	·780	·908	1·063
Standard deviation ..	·180	·324	·414	·565
Mid Grades:				
Median	·318	·420	·459	·501
Mean	·361	·570	·560	·768
Standard deviation ..	·139	·527	·326	1·210
High Grades:				
Median	·291	·410	·374	·404
Mean	·294	·394	·412	·428
Standard deviation ..	·147	·219	·112	·117

conditions of Information Load corresponding to 0, 1, 2 and 3 Bits respectively and shows that times are a linear function of Information. This is what one would expect if the transmission capacity of a communication channel were being measured. The times taken by the three groups diverge as Information Load is increased so that they resemble each other most in the no Bits condition.

The counterbalanced design should equate presentation order and practice effects within the three groups but this in itself is not adequate for analysis of variance. An A. of V. was therefore carried out using for each group only the times obtained on conditions presented first in order. Thus each group is represented by six different subjects doing each of the four conditions for the first time. The results of this analysis are set out in Table IIA. To check the influence of the variance, a weighted analysis of variance was carried out on the results of the Low Grade group (Table IIA). The variance ratios are of the same order of magnitude and significance and thus the unweighted analysis of variance may be accepted as a reasonable estimate. If 5 per cent. levels of significance are accepted it will be seen that for the Low and High Grade groups

Table IIA

Analysis of Variance I

	F Ratio	p Value (Per cent.)
High Grades:		
Regression of Time on Information: ·057487 secs. per Bit:		
(1) Due to regression: within loads	10·04	<1
(2) About regression: within loads	2·10	<20
Mid Grades:		
Regression of Time on Information: ·040104 secs. per Bit:		
(1)	1·64	N.S.
(2)	3·71	<5
Low Grades:		
Regression of Time on Information: ·1495 secs. per Bit:		
(1) Unweighted	11·73	<·1
Weighted	8·82	<·1
(2) Unweighted	1·51	N.S.
Weighted	·79	N.S.
Pooled:		
About regression: within loads	2·16	<10
About mean regression: within loads	3·18	<5
Due to mean regression: within loads	19·18	<·1

the effect of Load is significant and the regressions do not depart significantly from linearity. This is not the case, however, with the Middle Grade group. The pooled analysis of variance demonstrates that, despite the effect of the mid grades the regressions are linear and the effect of Load is significant and the slopes differ significantly. The above analysis makes use of only a quarter of the data, it was therefore decided to carry out an analysis of variance on the whole data. This is presented in Table IIb. In this the estimates of variance are not strictly independent. Subject and learning effects and their interaction with each other and with the main effects are suppressed. However as a counter-balanced design was used and the results are particularly clear-cut, it is suggested that this is a fair, if not strictly accurate representation of the main results. The regressions do not differ significantly from linearity, the slopes are very significantly different and the effect of Information Load is highly significant. The results of the High Grade group resemble closely results obtained from three normal subjects during preliminary investigations and the real distinction seems to be between the imbecile group and the mid and high grades. In other words, the differences would appear to conform more or less to the distinction between the imbecile brain-damaged population and the feeble-minded population.

Table IIb

Analysis of Variance II

	F Ratio	p Value (Per cent.)
High Grades:		
Regression of Time on Information: ·042625 secs. per Bit:		
(1) Due to regression: within loads	20·66	<·1
(2) About regression: within loads	2·53	<10
Mid Grades:		
Regression of Time on Information: ·056864 secs. per Bit:		
(1)	12·69	<·1
(2)	1·11	N.S.
Low Grades:		
Regression of Time on Information: ·168079 secs. per Bit:		
(1)	20·66	<·1
(2)	·23	N.S.
Pooled:		
About regressions: within loads	·39	N.S.
About mean regression: within loads	15·82	<·1
Due to mean regression: within loads	16·63	<·1

Examination of the means and medians of the remaining three elements indicates a slight tendency for the effect of Information Load on the Reach element to spread through the complete cycle. The effect is small and as the variances tend to be large with these subjects there would be small returns for any attempt to detect significant trends.

V. Experiment (*ii*)

It was decided to investigate the effects of practice on the peg board task. Thirty-six subjects selected from those who had taken part in the first experiment were made to carry out 1,200 cycles of the operation in fifteen runs of eight on ten consecutive days (excluding Sundays). Twelve subjects from each intelligence group were chosen as representing typical performance of their group. In each group of twelve three subjects did each of the four conditions for the entire practice period, thus there were twelve in each intelligence group and nine in each condition. The apparatus and experimental situation were as before but only the first and each tenth run of eight cycles were recorded and scored.

VI. Results of Experiment (*ii*)

The numbers in the experimental groups were too small in view of the variance within groups for it to be worth attempting a full scale analysis and pressure of time did not admit of any increase in the number of subjects. The results presented in Table IIIa can therefore only be taken to represent general trends. The mean times are derived from the scored trials in each quarter of the practice series and the last and first quarters taken as final and initial performance. On initial performance the same picture is presented as with the first experiment. As in the previous experiment the four elements were timed separately. The percentages to the right of the table are based on initial performance taken as 100 per cent. in each case. Table IIIb shows the percentage gain of final over initial trials. In all elements except Grasp it is the Low Grades who show the greatest percentage improvement. The ratio of percentage gain to the absolute initial level of performance (the last column) is approximately constant over the total task and on all individual elements with the exception of Grasp, which is the smallest element. This would seem to indicate that whilst Low Grades show more improvement this is related to their initial level of performance which is always poor. Whilst this was a smaller experiment than

Table IIIa

	Mean Times for 4 Stages of Training				Percentage Improvement			
	Total Task							
High Grade	1·608	1·458	1·407	1·338	100	91	88	83
Mid Grade ..	2·059	1·828	1·665	1·606	100	89	81	78
Low Grade ..	3·521	2·764	2·412	2·328	100	79	69	66
	Grasp							
High Grade	·200	·184	·167	·151	100	92	84	76
Mid Grade ..	·204	·201	·188	·187	100	99	92	92
Low Grade ..	·316	·291	·239	·215	100	92	76	68
	Transport Loaded							
High Grade	·388	·357	·366	·337	100	92	94	87
Mid Grade ..	·499	·462	·434	·414	100	93	87	83
Low Grade ..	·858	·682	·635	·592	100	79	74	69
	Assemble							
High Grade	·635	·593	·549	·523	100	93	86	82
Mid Grade ..	·768	·630	·565	·566	100	82	74	74
Low Grade ..	1·239	1·010	·885	·885	100	82	71	71
	Reach							
High Grade	·385	·324	·325	·327	100	84	84	85
Mid Grade ..	·588	·535	·478	·439	100	91	81	75
Low Grade ..	1·108	·781	·653	·636	100	79	70	67

TABLE IIIB

Relation Between Overall Improvement and Initial Time

	Percentage Gain	Initial Time Percentage Gain
	Total Task	
High Grades	17	·0946
Mid Grades	22	·0936
Low Grades	34	·1036
	Grasp	
High Grades	21	·0083
Mid Grades	8	·0255
Low Grades	32	·0093
	Transport Loaded	
High Grades	13	·0298
Mid Grades	17	·0294
Low Grades	31	·0277
	Assemble	
High Grades	18	·0353
Mid Grades	26	·0295
Low Grades	29	·0427
	Reach	
High Grades	15	·0257
Mid Grades	25	·0235
Low Grades	43	·0258

would be necessary to establish these trends the results do find some confirmation in practice. Dr. A. D. B. Clarke in a personal communication reports that imbeciles start off far worse but after prolonged practice show more relative improvement than higher grade patients in a variety of manipulative tasks.

VII. DISCUSSION

These experiments have been presented as a preliminary contribution to a suggested new approach to the theoretical and practical problems involved in the evaluation and placement of mental defectives. There can be no doubt that a new and systematic approach is needed. As a first consideration some difficulty and difference of opinion is involved in the use of the traditional categories of mental and motor abilities. Not only is the predictive value of tests of motor ability in doubt with respect to the placement of mental defectives but even intelligence gives little indication of what an imbecile can achieve given suitable training. The second and more important consideration is that an entirely new conception of work allocation for defectives is emerging from imaginative attempts to train such patients in manipulative factory type jobs. It is therefore suggested that the categories of measurement reflect the categories of new job requirements. This is essentially a human engineering approach in which it is meaningful to investigate the properties of the job and the properties of the operator. The traditional attempts at measuring motor ability whilst concentrating on evaluation of the operator in terms of special abilities leave the demands of the job to be subjectively estimated, e.g. this job requires considerable motor co-ordination, or alternatively must validate each test or ability against each job. This is a most uneconomical procedure. The *Therbligs* seem to be useful categories for job evaluation but whilst a job may be described in terms of its component elements it would appear that some variables may affect these elements. Predetermined Motion Times or Methods-Time-Measurement attempt to deal with these within-element variables but imply a normal operator. We must investigate the within-element variables as they affect the subnormal operator and the concept of Information Load is, in this context, an attempt to define what appears to be a major within-element variable. The operator in the task situation is conceived to act as limited capacity communication channel and his performance is determined by the information he can transmit. The Information Load is, as in the case of the present experiment, objectively definable and it is this characteristic which makes it such a useful type of measure, different in principle from the usual kind of mental measurement.

There are many technical difficulties involved in measuring the Information Load in a given task or element of a task and it is not the object of this paper to investigate these difficulties but rather to demonstrate the principle in a relatively simple case and suggest that this type of programme might profitably be pursued. The central theme of such a programme would be the two complementary techniques of Job Analysis and the evaluation of the operator in terms of the job requirements. The Information Load of the job must be defined as must the Information Capacity of the operator. Such a technique would be useful in so far as selection may be applied equally to the operator or the job. Thus not only may appropriate jobs be selected but jobs may also be adapted by reducing the Information Load according to the principles of human engineering. The use of special jigs for pre-positioning assemblies, and tools which are geared so that an accurate result may be achieved by a gross movement are two of the more obvious examples. In all this the aim is to make the defective population productive in the hope that this will at the same time prove therapeutic.

In mental deficiency two primary areas of research are training and aetiology and in general it is hoped that mental measurement should contribute to both. The significance of these results for aetiology must be examined. One outstanding result of these experiments has been that the Low Grade group would appear to be poor information handling systems whilst the High Grades are relatively normal. The difference appears to correspond to the non-normal distribution of intelligence in the imbecile group which is taken to indicate a high incidence of actual brain pathology. It would appear from this that information capacity is some kind of correlate of cortical integrity. The neurological implications are, however, far from straightforward. It should be recognized that the information theory approach is not designed to make neurological predictions through the analogy of telephone wires and neurons. Information theory was specifically designed to deal with a situation which avoids looking inside the "black box" and is not meant to represent specific events which may or may not occur inside it. It is essentially descriptive of the properties of an entire system and not a model for the actual working of the system. Possible neurological hypotheses are illustrative of this point. Whilst it was a fairly easy guess that the imbecile is a poor information-handling system there are at least three equally tenable alternative explanations of why channel capacity of such a system is limited. The most obvious is that in the imperfect brain there are simply less connections available. In other words, the small size of the properly functioning parts of the brain limits the channel capacity. The second possibility is Noise. The amount of information a channel can transmit may be limited by the Noise in the channel. This immediately suggests the neurological parallel of epileptic disturbance but imperfect receptor systems could also simulate the properties of Noise. Finally poor learning would mean that less information would be transmitted by what is apparently the same set of stimuli. (For further explanation of this point see Annett and Kay, 1956.) In short the demonstration of limitations in channel capacity in imbecile subjects does not suggest a particular neurological hypothesis to the exclusion of others. More fundamental research would be required to establish more clearly the properties of the imbecile nervous system as an information channel and suggest more precisely the nature of its limitations but there is no guarantee that such research would lead to the establishment of neurological facts; it could only lead to hypotheses which would have to be independently tested. From the psychological standpoint, however, the concept of channel capacity would seem to have very useful possibilities in planning training and employment in Sheltered Workshops.

VIII. SUMMARY

1. Problems about the motor abilities of mental defectives indicate the necessity for a reconsideration of methodology in this area. Changed ideas of what jobs defectives can do or should be trained to do increase the need for a systematic investigation of job requirements with respect to the specific limitations of such patients.

2. It is suggested that the *Therbligs* may provide useful ready-made categories and that the within-element variables may be subsumed under the concept of Information Load.

3. The operator considered as a limited capacity channel in the operator-task system may be assessed with respect to channel capacity and the task may be assessed with respect to the objectively measured Information Load.

4. The results of an experiment in which the Information Load of one of four elements was increased by a definite amount illustrate the point that operators behave as though they were limited capacity channels and that imbeciles show significantly poorer transmission rates than High Grade patients.

5. The same task used in a learning experiment demonstrated that imbeciles whilst starting off worse tend to improve more with practice.

6. Whilst it seems possible that channel capacity may be limited by brain pathology the difficulty of generating neurological hypotheses from this data is underlined.

7. The results indicate the possibility of using such techniques both for selection and job evaluation and for adapting jobs to suit the limitations of the mentally defective.

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THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY IN RECIDIVIST PRISONERS

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While Visiting Psychiatrist to a convict prison, the author used the M.M.P.I. as an aid to clinical diagnosis. The test did not prove helpful in that respect. Impressive, however, was a profile recurring so often as to appear typical of the recidivist in prison.

The population of the prison was about 220. Fifty prisoners were interviewed and the M.M.P.I. administered to 24 of them. Each subject performed the test either alone in his cell or in a room in the hospital block; the result was scored by a skilled assistant. Three prisoners repeated the test. There were therefore 27 profiles available for assessment. Since it was not possible to test a control group of non-criminals in the prison and in view of the small numbers involved in this survey, the conclusions are impressionistic and no statistical assessment has been attempted.

The most striking feature of these profiles is the high F score. Of 27 profiles, F is above T score 50 in 25 cases and above 70 in 15 cases. If similarly measured, 3 scores would be above 100. In addition, 24 profiles show at least one abnormal score (over 70) in the 11 personality scales; 15 profiles have abnormal scores in 6 or more. A "typical" recidivist profile therefore has the appearance of Figure 1.

The F scale of the M.M.P.I. serves as a check on the validity of the entire Inventory and it is generally understood that a score over 70 invalidates the record. A high F score has not been thought indicative of a particular clinical entity, but the M.M.P.I. Manual (1943) points out that F scores may be validly high for certain subjects who are either "highly individual and independent" or "rather badly neurotic or psychotic".

Several authors have commented on the F scale. For example, Kazan and Sheinberg (1945) studied the scale in Army personnel and concluded that a high F score was only rarely an invalidating factor when considering abnormal subjects and generally indicated significant psychiatric disorder. Schneck (1948) studied male prisoners at U.S. disciplinary barracks. Of 140 Inventories 17 had an F score of 70 or above. Seven of the 17 were believed truly invalid; 10 were considered valid and an additional indication of severe personality disturbance. Brozek and Schiele (1948), working on the effects of semi-starvation in experimental subjects, concluded that a high F score often indicated the presence of significant personality disturbance. Gough (1947) and Hunt (1948) discussed the effect of deliberate deception on M.M.P.I. results. They used the F–K index as an indication of malingering. However, the index appears to be of value only in direct and even naïve deception. In addition, as Hunt points out, in subjects such as the service prisoners he was dealing with, elevation of F score appears frequently as a reaction to environmental difficulties. Thus large F minus K values occur more often in such a

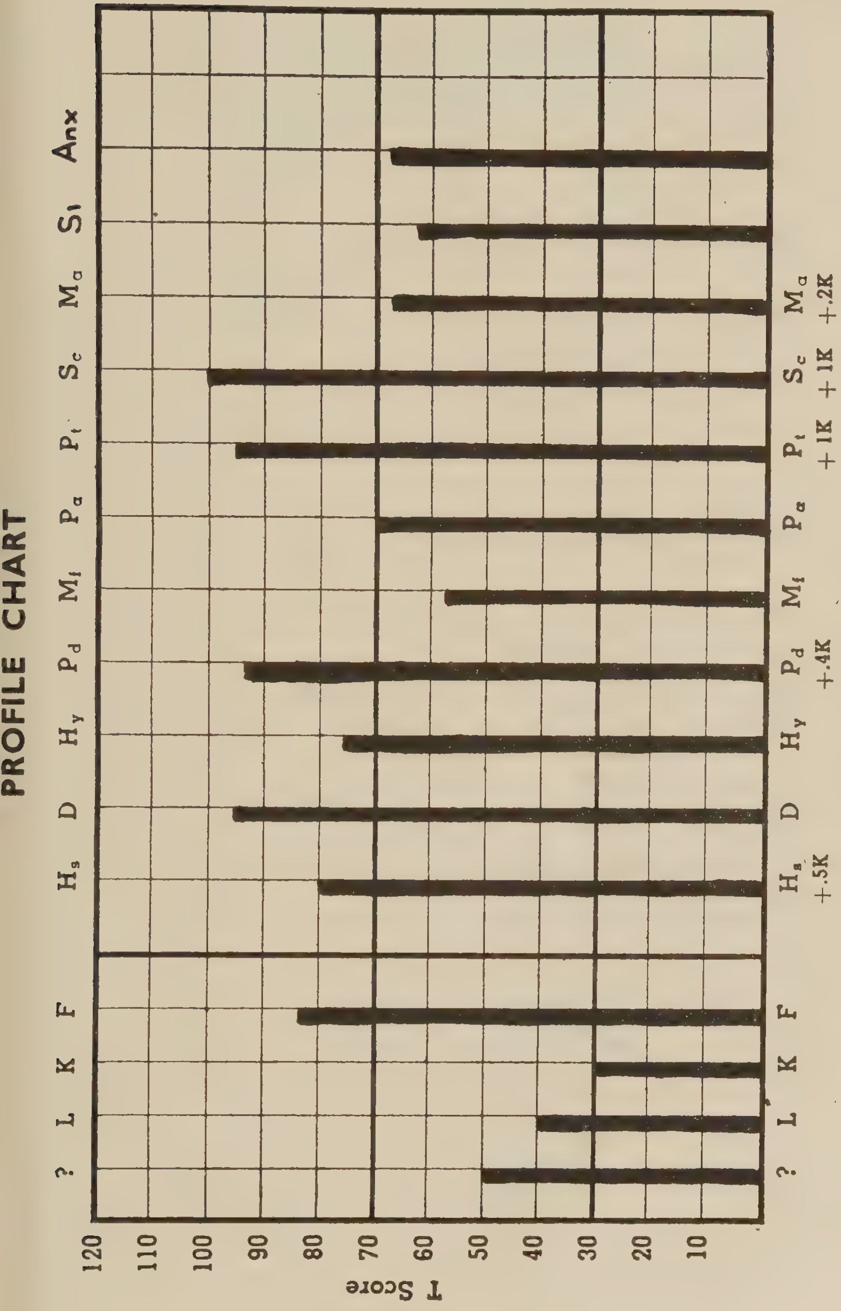

FIG. 1.—Recidivist M.M.P.I.

Validating scales: ?, L, F and K.

Personality scales: Hs hypochondriasis, D depression, Hy hysteria, Pd psychopathic deviate, Mf masculinity-femininity, Pa paranoia, Pt psychasthenia, Sc schizophrenia, Ma hypomania, Si social introversion, Anx anxiety.

group and consequently honest profiles are misidentified as deceptions. Also it has been suggested by Schmidt (1948) that the K factor is related to socio-economic influences.

The F–K index, applied to the 27 Inventories, labels 7 subjects malingerers and 3 as "faking good". On clinical grounds and backed by the views quoted above, I am rather unwilling to accept this finding, While the 3 "faking good" results agree with clinical impression, I feel sure that some of the prisoners who had no motive for deception are wrongly classed as malingerers.

It may be stated that a high F score is due to one or more of four factors:

(1) Subject unable to read or understand Inventory.
(2) Clerical error in recording or scoring results.
(3) Deliberate deception.
(4) Personality disorder.

Several tests performed by intellectually backward or disturbed prisoners were excluded from this study; cause (1) can be eliminated in the remainder. Care was taken to discount (2). To investigate and eliminate cause (3) the individual responses to the 64 items from which the F score is derived could have been noted and discussed with the subject. This did not prove possible. Instead, the test was repeated in three fully investigated prisoners to determine whether their profiles were reproducible. In fact the test, repeated after an interval of six to seven months, reproduced the original profiles very closely and in each case with a repeat of an abnormally high F score. There was no reason for these three prisoners to malinger and it would be clever deception indeed to reproduce nearly identical responses. I conclude, therefore, that while deliberate deception is an important cause there remains a number of high F scores attributable to cause (4). The impression gained is that a high F, together with several abnormal scores on the personality scales, is meaningful in terms of personality disorder of anti-social type.

The 24 prisoners involved in this study may be grouped diagnostically as follows: Psychopathic personality 10, depression 5, anxiety state 4, schizophrenic reaction 4, epilepsy 1. The M.M.P.I. was not found useful in making these diagnoses, mainly because the results suggested a much more disturbed population than was manifestly the case. For example, the Sc scale was often abnormally high where no frank schizophrenic features were clinically apparent. Peaks occurred most frequently and clearly in the scales Sc, D, Pt and Pd, in that order. It was felt at one stage that the high F score invalidated the whole profile. However, studying the profiles at a later date, I concluded that they generally did reflect the personality traits of the subjects; but the absolute heights of the scales are misleading and attention should be paid rather to their relative heights and to the general pattern of the profile.

Psychologists and psychiatrists working in prisons and Borstals have felt the need for an easily administered personality test. An Incomplete Sentence Test (J. B. Rotter, author) is under investigation in this country and gives promise. The tests usually employed (e.g. Rorschach, T.A.T., Porteus Mazes) either tend to be time-consuming or require considerable experience in their interpretation. This brief study is concerned only with the M.M.P.I. To my knowledge, the latter is not employed to any great extent in prisons and it seems worthy of further investigation and wider application. It may prove a convenient technique for assessing those socially deviant personalities who constitute such a problem both in custody and at large.

SUMMARY

The M.M.P.I. was administered to 24 subjects in a convict prison. In the majority, grossly abnormal profiles with high F scores resulted. It is argued that an abnormal F score does not necessarily invalidate the Inventory but, when found together with such a personality profile, indicates a particular kind of personality disorder found in recidivist criminals in prison. A larger scale investigation would be valuable.

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THE USE OF ARFONAD FOR THE ALLEVIATION OF CARDIO-VASCULAR STRESS FOLLOWING ELECTRO-CONVULSIVE THERAPY

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THE safety of electro-convulsive therapy (E.C.T.) has been greatly increased since muscle relaxants were first introduced for this purpose (Palmer, quoted by Hobson and Prescott, 1947). Short-acting relaxants such as suxamethonium and suxethonium reduce the usual strong tonic and clonic contractions to faint muscle twitchings, and fractures do not occur. Respiration can be maintained throughout by positive pressure inflation so that cyanosis and stertorous breathing are avoided. This may ensure that material from small pulmonary lesions is not disseminated to other areas. It is disappointing that the cardio-vascular commotion is only slightly reduced, and deaths still occur, albeit rarely.

Kolb and Vogel (1942) reported 4 deaths from E.C.T. treatment of 7,207 patients. Impastato and Almansi in the same year found 8 deaths reported in an estimated 11,000 cases; i.e. 1 in 1,802 cases, and 1 in 1,333 respectively.

In Great Britain 65 deaths were reported to the Board of Control during the years 1949–1953 from in-patients in mental hospitals. During these years 300,000 patients were admitted. Assuming that 50 per cent. of admissions receive E.C.T., then 150,000 were treated. Rather more patients actually were treated, as chronic patients admitted prior to 1949 also received treatment. This gives an estimated death rate of 1 in 2,300.

Maclay (1952) recorded 62 deaths following E.C.T. which were reported to the Board of Control. These occurred between 1947 and June, 1952. They do not include deaths from E.C.T. given in general hospitals, neurosis units, or in out-patient treatments. Dr. Maclay has kindly allowed one of us to study the reports of deaths following E.C.T. which have been submitted to the Board of Control between July, 1952 and November, 1955. During this period a further 28 deaths occurred. As the dates of these deaths are not available the average figures for this period are given in Table I. The age of the patients is given in Table II.

TABLE I

Yearly Death Rates From E.C.T. Treatment

Year . .	1947	1948	1949	1950	1951	Jan.-June 1952	July 1952-Dec. 1955
Deaths	4	3	13	14	19	7	Yearly average 8
Total	60 deaths—28 with relaxants						28 deaths—13 with relaxants.

TABLE II

Age of Patients Who Died Following E.C.T.

	Under 26	26–35	36–45	46–55	56–65	66–75	76–85	Total
Maclay 1947–52	–	6	10	11	21	9	5	62
1952–55	1	2	5	6	5	8	1	28
Totals ..	1	8	15	17	26	17	6	90

Since 1947 there has been a gradual extension of the use of .EC.T. During the years 1947 and 1948 relaxants were very rarely used. Curare, gallamine and decamethonium became successively popular in the years 1949–1952. At Hill End and at many other hospitals all convulsion treatments are given under the influence of short-acting relaxants. Since these drugs have been introduced, treatment has been received by many frail and elderly patients to whom it was previously denied. Notwithstanding the increased use of treatments the annual death rate has fallen, suggesting that these recent techniques are successful.

The deaths which have followed E.C.T. have been analysed in an attempt to determine the responsible factors in order to see if any further change in technique might be beneficial.

In some cases there is an obvious fatal lesion, e.g. cerebral haemorrhage or pulmonary embolism. More frequently there is a history of sudden cardio-vascular failure occurring shortly after the electrical stimulus. This may produce immediate death, or less frequently, the patient lingers in coma and dies in the succeeding few days. This failure may not be fatal, and two patients are known to have recovered after a post-E.C.T. coma of two days duration. In these cases there is sometimes a coronary infarct found at post-mortem; often, however, the only pathological lesions recorded are those secondary to acute heart failure. It is probably correct to include the following from Maclay's cases in this category. Cardiac failure—22 cases; respiratory failure—6 cases; cardiac arrest—1 case; vagal inhibition—1 case; acute pulmonary oedema—3 cases; pulmonary collapse—1 case. The term "sudden cardiac failure" is used to describe these cases. Table III shows the causes of death in 90 cases which have been reported, amended as above-mentioned.

TABLE III

Causes of Death from E.C.T.

	1947–52	1952–55	Total
Sudden cardiac failure	34	15	49
Coronary thrombosis	10	7	17
Lobar or bronchopneumonia	4	3	7
Cerebral haemorrhage	4	1	5
Anaesthetic death	4	–	4
Pulmonary embolus	3	–	3
Intestinal rupture	1	1	2
Bronchial obstruction	2	–	2
Pneumothorax	–	1	1

It can be seen that 66 of these are due to cardio-vascular complications. If the stress of E.C.T. on the heart could be reduced the major fatal complication might be eliminated, i.e. 73 per cent.

CARDIO-VASCULAR COMPLICATIONS OF E.C.T. LITERATURE

Woodbury and Hamilton (1941) found that convulsive doses of leptazol raised the arterial pressure by 100 mm. of Hg. This rise was reduced when curare was used. Holmsberg *et al.* (1953) compared the effect of E.C.T. on the cardio-vascular system with and without the use of muscle relaxants. Direct arterial records were taken, using a mechano-electronic transducer manometer. They found that with the injection of 100 mg. of suxamethonium the mean rise in arterial pressure following E.C.T. was 64·4 mm. of Hg compared with 87·9 without. The variations in pulse pressure which were marked in unprotected cases became small. The rise in arterial pressure was less abrupt, and jerky variations were lacking. The venous pressure after E.C.T. rose by 7·0 mm. of Hg when relaxants were used, compared with 31·4 mm. of Hg in unmodified cases. The heart rate increased by an average of 84·4 beats per minute after straight E.C.T., but only 31·4 beats when suxamethonium was used. Ectopic beats followed the stimulus in half the patients who received modified E.C.T.

The incidence of cardiac arrhythmias following E.C.T. using tubocurarine was reported as 48·1 per cent. by Bankhead, Torrens and Harris (1950); and 57·9 per cent. by Hejtmancek, Bankhead and Torrens (1949). Following suxamethonium, Nowill, Wilson and Borders (1954) record an incidence of 42·5 per cent.; Green and Woods (1955) 39·5 per cent.; and Lewis, Richardson and Gahagan (1955) 46·8 per cent. Of the 46·8 per cent. referred to by the last-named authors 14·6 per cent. were mild (auricular premature beats, scattered ventricular premature beats, short runs of bigeminy and trigeminy); 50·5 per cent. were moderate (frequent ventricular premature beats, long runs of bigeminy or trigeminy); 27·2 per cent. were severe (frequent ventricular premature beats beginning disruption of basic cardiac rhythm); 7·7 per cent. very severe (disruption of basic cardiac rhythm, ventricular tachycardia, asystole for 6 or more seconds). The patients tended to repeat their abnormalities in further treatments. In a typical case the arterial pressure rose by 70 mm. of Hg returning to normal in 4½ minutes. Green and Woods (1955) noted a tachycardia of over 130 beats per minute in 65 per cent. of 214 records.

Brown *et al.* (1953) noted that a similar cardio-vascular response to E.C.T. occurred in major reactions, subconvulsive treatments, and in completely curarized patients. They conclude that it is a general response to stimulation of the central nervous system.

Holmberg (1953) found that repetition of subconvulsive stimuli caused severe hypoxia.

Weil-Malherbe (1955) claimed that the plasma adrenaline rose by 75·5 per cent. immediately after an unmodified seizure and returned to normal in 10 minutes. Following hexobarbitone and Brevidil the plasma adrenaline fell by 60 per cent. If E.C.T. was given, then the peak increase level in adrenaline was only slightly below that following an unmodified fit.

This rise in adrenaline level did not occur when both electrodes were placed on the same side of the head. The rise following E.C.T. was therefore not due to local tissue stimulation, but to a central effect (Montague, 1955). The method used for these adrenaline estimations has been criticized (*British Medical Journal* annotation, 1956).

PRELIMINARY EXPERIMENTS

It appears that despite minimal muscular activity and full oxygenation, there are considerable changes in the cardio-vascular system immediately after the shock. These changes appear to be due to the stimulation of the vagal and sympathetic centres. They may be manifest as vagal bradycardia, cardiac arrest, hypertension and premature beats.

It was thought necessary to confirm the presence of these changes with the accuracy provided by simultaneous electrocardiograms and pressure recordings by a capacitance manometer. The patients were given a standard dose of 1/50 grain of atropine intravenously with 0·2 g. of thiopentone. This was followed by 30 to 50 mg. of suxamethonium chloride in a separate syringe. A stimulus of approximately one second was then given, using an "Ectron" apparatus with fixed voltage of 150 volts. Intra-arterial pressures were measured from the brachial artery using a Sanborn Electromanometer.

Thirteen records were studied, each taken from a different patient. Following the electrical stimulus bradycardia was frequent. Four records showed asystole of 0·24, 3·4, 4 and 7 seconds. This was followed by tachycardia and hypertension which reached a peak at about 15 seconds. There was a gradual return to resting levels, eleven cases reaching this by the 4th minute, and another by the 5th minute. The other patient had a pre-E.C.T. systolic pressure of 140 mm. of Hg and a post-E.C.T. systolic pressure of over 200 mm. of Hg which was sustained for the 6½ minutes of the recording. She was known to have a labile blood pressure which could reach 200 mm. of Hg with apprehension. Five patients had ventricular premature beats; four showed coupling for short periods; and one had a marked vagal bradycardia for the first 14 seconds.

Four intravenous pressure recordings were taken. In two of these there was no appreciable rise following treatment. In one patient the pressure rose from 4 mm. to 30 mm. of Hg after the fit. In the other patient the relaxant was probably given extravenously. The first electrical stimulus was unsuccessful; nevertheless the venous pressure rose from 14 mm. to 60 mm. of Hg. The second stimulus was successful and raised the venous pressure to 110 mm. of Hg—dramatic evidence of the severity of E.C.T. without relaxants.

In 2 patients the C.E.F. pressure was recorded during E.C.T. In the first patient the pressure rose from 5 mm. of water to 65 mm. of water 10 seconds after the fit. The pressure then fell to 28/21 with arterial-like variations at 30 seconds; and at 2 minutes was 14/10 mm. The arterial pressure rose from 100 mm. of Hg to 140 mm. shortly after the stimulus. The second patient had a much stronger convulsion and the C.S.F. pressure tracing was arterial in character throughout. Before treatment it was 120/70 mm. of water, while the arterial pressure was 110/85 mm. of Hg. After thiopentone and suxamethonium, it rose to 470/300 mm. of water. Immediately following the stimulus, the C.S.F. pressure rose to 920 mm. of water, falling to 320 mm. until the first pulse wave at 3·6 seconds, when it rose steeply to reach 1,070/820 mm. of water. At 30 seconds the pressure was 1,120/670; at 2 minutes 330/170; the arterial pressure being 160/110 mm. of Hg. At 4 minutes the C.S.F. pressure was 40/19 mm. of water; the arterial pressure 120/98 mm. of Hg.

These experiments confirmed the rise in blood pressure, the incidence of cardiac arrhythmias, and the severity of the rise in venous pressure and C.S.F. pressure when muscle relaxation is not adequate.

PROBLEM

The production of an artificial epileptic fit entails the use of an agent which also stimulates vagal and sympathetic centres. These occur to some extent in spite of minimal muscular activity. Attempts to reduce the fracture incidence following E.C.T. by slower induction of the fit and continuation of the current throughout the clonic stage in order to avoid sudden jerking would be likely to increase the cardio-vascular stress ("Glissando" and "Ectonus" E.C.T.). Hypertension following electronarcosis may be very severe, and the treatment is known to have a much increased death rate (Harris, 1954).

A premedicant was sought having the following properties:

1. Hypotensive action.
2. Parasympathetic ganglion blocking action to avert the asystole and bradycardia which occur immediately after the stimulus is offered.
3. Sympathetic blockade to avoid adrenaline release, hypertension, tachycardia and increased cardiac irritability.
4. The drug should be short-acting, as the cardiac stress is only of 4 minutes duration.

A drug which has these properties is Arfonad (Randall, Peterson and Lehmann, 1949).

Further experiments were undertaken to assess the value of this agent. It was decided that the cardio-vascular changes were so gross that they could be easily assessed by a sphygmomanometer and single channel electrocardiograph; and these were used for the remainder of the study.

THE EFFECT OF ARFONAD ON THE BLOOD PRESSURE RESPONSE

Sphygmomanometer records were taken during 117 treatments with atropine modified E.C.T. The blood pressure was recorded before and after the injections of the anaesthetic and relaxant, and again at $\frac{1}{2}$, 1, 2, 3 and 4 minutes' interval after the stimulus. A second group of 108 treatments were given, using Arfonad as an alternative to atropine. Arfonad, being incompatible with both thiopentone and suxamethonium, was given in a separate syringe following the thiopentone. Twenty mg. was used as a standard dose, although it was later realized that only 10 mg. were required in the elderly. Patients were divided into three groups. The first group, 76 atropine and 72 Arfonad treatments, had a resting systolic pressure below 150 mm. of Hg. The second, 33 atropine and 31 Arfonad treatments, had a resting systolic pressure between 150 and 200 mm. of Hg. The third, 8 atropine and 7 Arfonad, had a resting systolic pressure of over 200 mm. of Hg. The patients were unselected admissions to the neurosis wards of Hill End Hospital, except that the atropine study was carried out about 3 months before the Arfonad study.

The average changes in systolic pressure following treatment are shown in Figure 1. There were a number of interesting individual cases. One patient pre-medicated with atropine had an unexpectedly strong fit; it was followed by a period of hypertension lasting for 4 minutes and reaching 80/50 mm. of Hg; this was followed by 8 minutes hypertension reaching 208/118 mm. of Hg. This type of reaction was found in 4 per cent. of curare E.C.T. treatments (Bankhead *et al.*, 1950).

In patients whose blood pressure rose with anxiety, E.C.T. produced more marked hypertension. Two patients with severe dehydration were treated with E.C.T. on three occasions. The blood pressure rose an average of 40 mm. of Hg above pre-E.C.T. levels immediately after the stimulus. This was followed by 5 minutes of hypotension, during which the systolic pressure fell to 70 mm. on each occasion. This was not accompanied by bradycardia. There were only

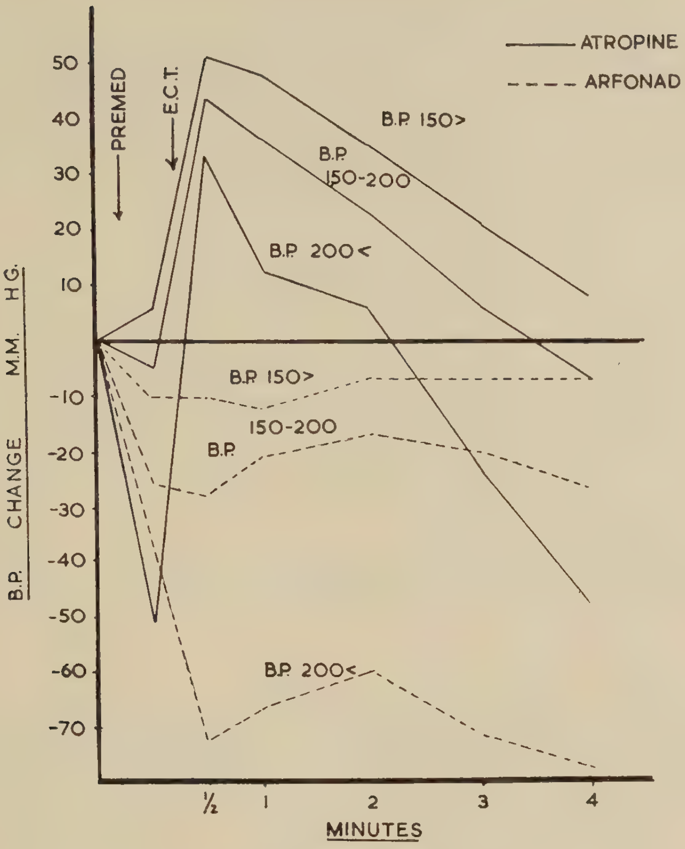

FIG. 1.

3 patients pre-medicated with Arfonad in whom the arterial pressure rose immediately after the stimulus; but in 8 patients the pressure was raised at the 4th minute by over 30 mm. of Hg above resting levels. Presumably, the Arfonad had been destroyed before the hypertensive effect of E.C.T. had ceased. It was noted that hypotension was more marked in elderly patients, who are more sensitive to Arfonad.

THE EFFECT OF ARFONAD ON POST-E.C.T. CARDIAC ARRHYTHMIAS AND CARDIAC ISCHAEMIA

A controlled study of 94 treatments on 31 patients was made. Each patient was given E.C.T. on 2, 4 or 6 occasions. The limb lead electrocardiogram was found to be unsatisfactory, because recordings from electrodes placed over muscle masses were often distorted during the clonic phase. A unipolar lead was used which was placed centrally over the sternum. This lead is not ideal for estimating ischaemia, but it was satisfactory for arrhythmias. The following was accepted as evidence of ischaemia:

1. T wave changes of 2 mm. or more.
2. S-T segment changes of 2 mm. or more.
3. Q.R.S. widening to over 0·11 seconds.

The E.C.G. records were started 10 seconds prior to the injections. They were recommenced about 2 seconds after the stimulus, and continued for 4 minutes. The duration of asystole which occurs immediately during and following the stimulus is therefore underestimated. A further series of patients were examined by continuous auscultation in order to eliminate this interval. Each patient was treated on 2, 4 or 6 occasions alternately with atropine and Arfonad.

TABLE IV

E.C.G. Changes After E.C.T.

Drug	No. of Patients	No. of Records	Normal	Extrasystoles	Coupling	Asystole	Nodal Rhythm	Changing Pacemaker	Ventritac	Ischaemia	Tachycardia	
											120/ 150	150+
Atropine	31	47	20	20	8	2	2	2	3	11	20	16
Arfonad	31	47	36	3	2	2	1	–	–	6	18	—
Auscultatory Changes Heard after E.C.T.:												
Atropine	27	44	16	26	4	5						
Arfonad	27	44	36	5	1	3						

The E.C.G. abnormalities found in this study are shown in Table IV. The findings indicate that Arfonad is as effective as atropine in reducing the incidence of vagal effects (hypertension, tachycardia and increased cardiac irritability). The reduction in salivation was the same for both drugs.

DISCUSSION

Cardiac arrhythmias following treatment can rarely be anticipated even by careful physical examination of the patient. They occur in all age groups. The most severe reaction (ventricular tachycardia) occurred twice during the treatment of a healthy young girl of 26 years who had an excellent exercise tolerance, although occasional extra-systoles occurred at rest.

There is no definite proof that these cardio-vascular changes are related to the sudden deaths that occur, though certainly in a small number of the patients reported in this series there have been some very alarming reactions. It is sometimes asserted that there is a morbidity from E.C.T. in the central nervous system. It may be that small haemorrhages due to the cerebral vasculature occur. There is certainly every reason to try to avoid these reactions.

TABLE V

Number of Convulsions Given Prior to the Fatal Treatment

No. of prior convulsions ..	0	1	2–8	9–19	20	Total No. of Prior Convulsions
No. of patients, Maclay, 1952	26	6	16	5	1	54
1952–55	11	7	9	1	–	28
Total No. of patients ..	37	13	25	6	1	72

Deaths occur in all age groups (Table II); one-half following the first treatment (Table V). Ideally, a prophylactic should be used in all cases who have not previously had E.C.T. If a severe cardiovascular reaction is noted after the first treatment given without pre-medication, it should be given on subsequent occasions. Atropine is a safe agent which substantially reduces vagal reactions and salivation, and surely should be used routinely (Bankhead *et al.*, 1950; Nowill *et al.*, 1954). The former authors also state that quinidine in doses of 3 grains q.d.s. during the treatment substantially reduces the severity and duration of ectopic beats, although this is not supported by quantitative evidence. Green and Woods (1955) recommend the injection of procaine amide intravenously, should a serious arrhythmia occur.

Arfonad was found during these experiments to have one drawback. It increases suxamethonium apnoea by approximately 2 minutes. Suxamethonium is broken down by the pseudo-cholinesterase of the plasma (Evans, Gray, Lehmann and Silk, 1952). The pseudo-cholinesterase was found to be lowered *in vitro* by Arfonad. This drug can only be recommended for use with suxamethonium if there is a particular indication, rather than as a routine prophylactic.

This difficulty should not prejudice its use with muscle relaxants which are not broken down by pseudo-cholinesterase. If a preparation of pseudo-cholinesterase were available commercially this objection would not be serious (Evans *et al.*, 1953).

Summary

1. The causes of death from E.C.T. have been investigated and found to be mainly of cardio-vascular origin.

2. The literature on the cardio-vascular changes after E.C.T. is reviewed, and the incidence of such changes is noted.

3. A study of blood-pressure changes and electro-cardiographic changes after E.C.T. with the use of atropine and Arfonad alternately as pre-medicants was performed.

4. The vagal C.V.S. changes are as effectively controlled with atropine as with Arfonad. The latter is much more effective in reducing the sympathetic over-activity.

5. Arfonad can only be recommended for use with relaxants depending on pseudo-cholinesterase for their breakdown where there is an obvious indication, as it has been found to increase the duration of suxamethonium apnoea. This disadvantage would be removed if there were a preparation of pseudo-cholinesterase available for intravenous use. Arfonad can be used freely with other relaxants.

Acknowledgments

We gratefully acknowledge the assistance given to us by Dr. Harold Palmer in suggesting this research, and his constant help and encouragement throughout.

We are also indebted to our colleagues and the nursing staff for generous help.

We would also like to thank Messrs. Marconi for the loan of the electro-cardiogram; and to Roche Products who kindly provided the Arfonad.

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DRUGS AND PERSONALITY

II. THE EFFECT OF STIMULANT AND DEPRESSANT DRUGS ON CONTINUOUS WORK

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INTRODUCTION

IN a previous paper one of us (4) has elaborated a theory relating drug action to personality. According to this theory, depressant drugs increase cortical inhibition (Pavlov) or reactive inhibition (Hull), thus producing an *extraverting* effect on personality, while stimulant drugs decrease inhibition and produce an *introverting* effect in behaviour. It was also suggested in this paper that a direct proof of the hypothesis might be obtained by making predictions regarding the effects of stimulant and depressant drugs on a variety of experimental laboratory situations connected with the general theory of inhibition and excitation.

When this theory is applied to what is often called the *work decrement*, i.e. the decrease in performance under conditions of continuous exertion, we may predict that (1) depressant drugs, by increasing inhibition, will lead to a more rapid and a more marked work decrement than would a placebo, and (2) that a stimulant drug, working in the opposite direction, would lead to a less rapid and less marked work decrement than would a placebo (4). There is some evidence in the literature supporting this hypothesis, particularly the excellent studies by Payne and Hauty (7, 8). In one of their experiments involving 144 subjects who had received preliminary training on a complicated compensatory pursuit task involving simulated aircraft instruments, and were then made to work continuously for four hours, it was found that dextro-amphetamine sulphate was singularly effective in minimizing work decrement, while a mixture of hyoscine and diphenhydramine hydrochloride hastened and maximized it. In another study, using 168 subjects who performed for 7 hours on a similar task, they found that dextro-amphetamine sulphate and caffeine effectively mitigated work decrement, while benadryl hyoscine had the opposite effect. All these results were highly significant statistically.

According to our theory, feelings such as boredom, fatigue, sleepiness, and so forth are the introspective concomitants of cortical inhibition (6). In terms of translating this theory into the drug field, we would expect such subjective feelings to *decrease* after the administration of stimulants and to *increase* after the administration of depressants. This deduction has been verified by several writers, in particular Barmack (1). He summarizes his work

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* We are indebted to the Bethlem Royal and Maudsley Hospital Research Fund for support which made this study possible.

by saying: "The interpretation is favoured that the effect of the benzedrine . . . is principally on the inclination rather than on the ability to do continuous repetitive work." This conclusion is in line with the Hullian notion of inhibition as a drive, and consequently the growth of a negative drive or "disinclination" as a result of continuous practice.

In view of what is known about the growth of reactive and conditioned inhibition, we would expect stimulants to be effective after some time rather than immediately. This follows from the simple consideration that their ability to decrease inhibition is dependent on the previous growth of inhibition; during the early stages of practice little inhibition has been developed and the drug, therefore, cannot show any considerable effectiveness in overcoming inhibition. Again, Barmack has shown that this deduction is verified. Here is a typical quotation from his work, summing up his results on continuous adding: "The differences in rate of work obtained for the two conditions (placebo versus drug) were negligible at the beginning, and most striking at the end of the work period." The work summarized in these few references certainly appears to be in line with the predictions from our theory; a more systematic review is given elsewhere (4, 6).

The Experiment

The experiment reported here is on a somewhat less heroic scale than that of Payne and Hauty, involving considerably less than 7 hours' continuous work. The apparatus used was the so-called *pursuit rotor*, consisting of a bakelite turntable into which a small metal disk is set near the circumference. This disk turns with the turntable, describing a circle in front of the subject who holds an articulated metal rod in his preferred hand, which he tries to keep in touch with the metal disk for as much of the time as possible. Electric clocks enable the experimenter to note the percentage of time that the subject is "on target" during successive 10-second periods. The instrument used and the instructions given have been reported previously in connection with another experiment (2).

The experimental conditions also duplicated those of our previous experiment. Five minutes of consecutive practice were followed by a 10 minutes' rest, a second 5 minutes' continuous practice, a second 10 minutes' rest and a third 5 minutes' practice period. The rest periods were included in order to allow the measurement of reminiscence phenomena. Briefly, the term reminiscence refers to the dissipation of reactive inhibition accumulated during continuous work, which takes place during a rest pause; this dissipation of inhibition is shown in performance by an improvement following the rest pause. It is measured by subtracting the last score before the rest period from the first score after the rest period. (Further details regarding the analysis of learning curves of this kind in terms of inhibition and reminiscence can be found in a previous paper (3).)

The subjects for the experiment were university students, all female; these were allocated at random to the four experimental groups. Group A, consisting of 18 subjects, was administered 10 mg. of dextro-amphetamine sulphate approximately 75 minutes before the beginning of the test. This group will be referred to as the "short dexedrine" group or D*S* group to distinguish it from group B, consisting of 15 subjects who were also administered 10 mg. of dextro-amphetamine sulphate, but who did not begin the test until at least 250 minutes had elapsed after the administration of the drug. This group will be known as the "long dexedrine" or D*L* group. The 18 members of the third group were administered 4½ grains of sodium amylobarbitone, while the 18 members of the fourth group were given a placebo. All subjects taking part in the experiment were also administered the Maudsley Personality Inventory, a questionnaire measure of neuroticism and of extraversion (5).

The following predictions were made:

1. Total performance will be highest under dexedrine, lowest under amytal, and intermediate under placebo conditions. The reason for this prediction has already been given in the introduction. It will be noticed that no differential prediction is made with respect to the two dexedrine groups; a perusal of the literature concerning this drug did not make it possible for us to say which of the two periods would be the more effective.

2. Differentiation between the groups on the basis of drug effects will be a function of time in the sense that it will be determined (*a*) by the length of time during which continuous work takes place, thus generating reactive inhibition, and (*b*) by the length of time elapsing from the administration of the drug to the beginning of the work periods which are being studied.

RESULTS

In Figure 1 are shown the scores of our four groups during the course of the experiment; 30-second trials have been plotted instead of 10-second trials in order to make the curves less irregular. (No additional information would be conveyed if the more detailed curves had been given.) It will be seen that during the first 5-minute period the only group which deviates considerably from the others is the D*L* group; as predicted, subjects in this group performed at a considerably higher level than placebo and sodium amytal subjects. During

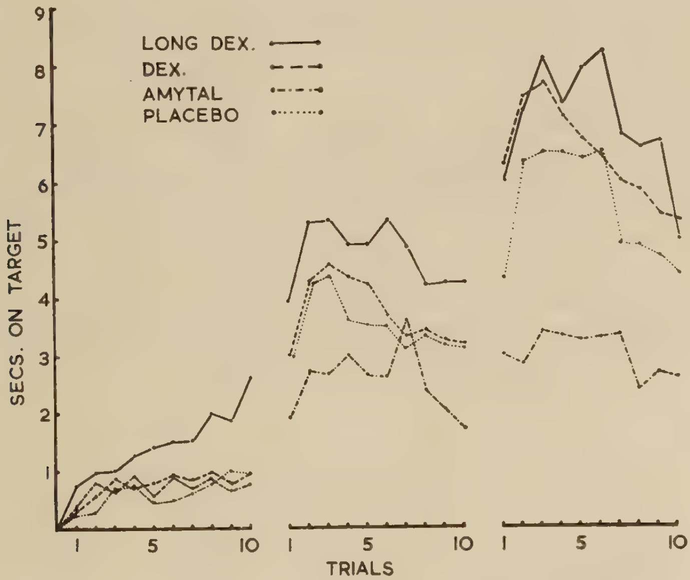

FIG. 1.—Performance on pursuit rotor during 3 five-minute periods of continuous work of three drug and one placebo groups. Seconds on target are plotted against 30-second periods.

the second 5-minute period the D*L* group is clearly the most productive, but now the amytal group has also become separated out and is clearly the least productive. The placebo and the D*S* group are still very close together and cannot be differentiated. During the third period the amytal group is very much the least productive, with the placebo group intermediate and the D*L* group at the top as before. This time, however, the D*S* group has also improved and overlaps with the D*L* group. Results seem to be very much in accordance with anticipation in so far as predictions 1 and 2 are concerned.

TABLE I

Source of Variance	Sum of Squares	df.	M.S.V.
Total	1255·1621	2,069	
Periods	728·0618	2	364·0309
Treatments	103·5507	3	34·5169
Period/treatment interaction ..	34·0668	6	5·6778
Residual	389·4828	2,058	·189253

Table I presents an analysis of variance of the results. As might have been expected, the difference in performance between the periods is very highly significant. So is the significance of the treatments, a result which verifies our first prediction at an acceptable statistical level. Also highly significant is the period/treatment interaction, a result which substantiates our second prediction at an acceptable level of significance. We may conclude therefore, that the drugs used have differential effects on performance, that these effects are in line with prediction and that they interact in complex ways with stage of practice and/or time elapsed since administration. (The former effect is probably the more important, as the total time taken up by the experiment is not very long—35 minutes. However, a separate experiment would be required to settle this problem decisively.)

(It may be mentioned in parenthesis that the randomization of our sample appears to have been adequate, because on starting scores, on extraversion scores, and on neuroticism scores analysis of variance failed to find any difference between the four groups which even approached significance.)

As in our theory stimulant drugs have *introverting* effects, while depressant drugs have *extraverting* effects, it may be of some interest to compare the results shown in Figure 1 with the performance of the 10 most introverted and the 10 most extraverted subjects out of a group of 50 students tested without drugs on this apparatus, under comparable conditions (2). Figure 2 gives the

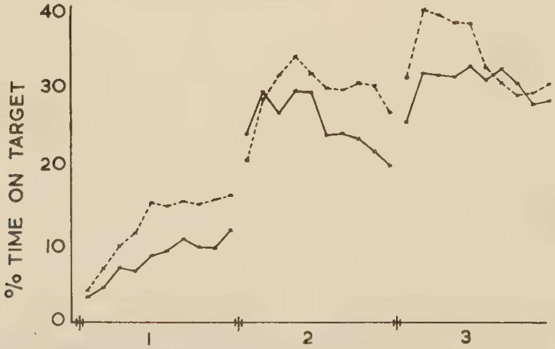

FIG. 2.—Performance on pursuit rotor during 3 five-minute periods of continuous work of 10 introverted (broken line) and 10 extraverted (solid line) subjects. Per cent. of time on target is plotted against 30-second periods.

detailed information; the points of similarity will be obvious. The introverts, like the dexedrine group, achieve an early superiority over the extraverts, or the amytal group; this superiority is sustained throughout most of the experiment. The differences between the two figures, such as the final equality of scores of extraverts and introverts in Figure 2, Period 3, are due to factors such as conditioned inhibition which are expected in terms of learning theory to play a part in the development of the reaction potential (${}_{S}E_{R}$), but which may not be affected by drugs in ways which can at present be predicted. There is much room here for further extension of our theory to other concepts in the field of learning theory.

SUMMARY

Two hypotheses were experimentally tested regarding the effects of stimulant and depressant drugs on continuous work. These predictions were made: (1) Depressant drugs will lower performance while stimulant drugs will increase performance as compared with the level of the placebo group. (2) There will be differential action of drugs over time due to the relatively slow build up of inhibition, and/or the increase in time of test since drug administration. Both predictions were verified at a high level of statistical significance. On the whole, the results of the experiment supported the general theory of drug action put forward.

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DRUGS AND PERSONALITY

III. THE EFFECTS OF STIMULANT AND DEPRESSANT DRUGS ON VISUAL AFTER-EFFECTS

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It is a well-known principle in psychology that the effects of sensory stimulation do not cease when the stimulus itself ceases. The so-called visual after-images are probably the best known of these after-effects, but almost equally well known are those induced by a rotating spiral (11). If a normal person fixates the centre of the rotating spiral for a period of time, and if then the motion of this spiral is suddenly stopped, an after-sensation of movement is well nigh universal. This after-sensation is opposite to the original motion in direction, just as the after-image produced by the fixation of a colour is usually the complementary colour to that which caused the original perception. There is little doubt that while peripheral factors play some part in these after-effects, central features also play a part (9), and it becomes tempting, therefore, to use phenomena of this type in attempts to verify or disprove the drug action hypotheses advanced by one of us in a previous paper (2). This hypothesis stated that stimulant drugs increased excitatory potential and decreased inhibitory potential, while depressant drugs decreased excitatory potential and increased inhibitory potential. The question now arises as to how this general postulate can be applied to the phenomena under discussion.

We are handicapped from the outset by the fact that the explanation of these after-effects is not in fact known. There are many different hypotheses, but it cannot be said that any of these are at all widely accepted (11). In the absence of a detailed theory, we may perhaps argue as follows. Underlying the perceptual after-effect, we must postulate some kind of neurological sub-stratum, i.e. the passage of neural currents across the synapses. Nothing can usefully be said about the precise nature of this hypothetical sub-stratum, but few people would probably doubt the dependence of psychological phenomena on neurophysiological events. Granted such a basis, it follows immediately from our knowledge of the processes of satiation and inhibition that these neural currents will produce inhibitory potentials which will tend to decrease the strength of these currents and finally stop them altogether (7, 8).

If this very rough and ready model is at all along the right lines then we would expect extraverts, hysterics and brain-damaged people to have very short after-effects, while introverts and dysthymics would have particularly long after-effects. This follows from the postulate advanced in the previous article (1) linking extraversion with excessive inhibition and introversion with

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* We are indebted to the Bethlem Royal and Maudsley Hospital Research Fund for support which made this study possible.

excessive excitation. It would also follow that depressant drugs should decrease the length of the after-effect, while stimulant drugs should increase the length of the after-effect (4). We therefore have a variety of ways in which various aspects of our general hypothesis can be tested. The only relevant paper we have been able to find in the literature is an article by Klein and Krech (6) in which they refer to an unpublished paper by Klein. Apparently Klein found that "where persistence of after-image was measured as a function of the duration of stimulus-exposure, it appeared that for longer exposures the duration of the after-images of brain-injured fell off significantly as compared with non-brain-injured. This could be interpreted to mean that among brain-injured neural activity in regions which had previously been exposed to prolonged excitation is 'dampened' as compared to 'normals', i.e. consequent upon the same amount of original excitation there is a greater degree of satiation in the brain-injured than in the non-brain-injured. That satiation in the brain-injured is not only greater in extent than in 'normals', but that it also persists for a longer time is suggested by another finding of Klein's: the rate of decrease in after-image duration upon repeated exposures was more rapid in the brain-damaged than in the controls. In general, then, Klein's studies are congruent with the hypothesis that in the brain-injured successive, prolonged exposure to stimulation induces *satiation* attributes . . .". It appears then that with respect to after-images, brain-damaged people, in line with our prediction, produce shorter after-effects than normals.

Price and Deabler (10) and Gallese (5) supply evidence showing that the brain-damaged are also inferior to normals with respect to the after-effects induced by the rotating spiral. Price and Deabler tested 40 normals, 40 non-organic psychotics, and 120 brain-damaged subjects on the spiral after-effect, giving 4 separate tests and simply determining whether or not an after-effect was perceived. (This method, which was also followed by Gallese, is very rough and ready, and should almost certainly be replaced in future studies by a more systematic exploration of the length of after-effect as a function of length of stimulation. However, the fact that positive results can be achieved even with this very crude technique suggests that the differences are very pronounced indeed.) Their results are given in Table I below, in which are reported the percentages in the various groups which saw after-effects on 0, 1, 2, 3, or 4 occasions; it will be obvious that the brain-damaged group is very significantly differentiated from the normal and functional groups.

TABLE I

	0 Per cent.	1 Per cent.	2 Per cent.	3 Per cent.	4 Per cent.
Normals	0	2·5	0	5	92·5
Functionals	0	0	2·5	2·5	95
Brain-damaged	60	10	20	8	2

These very striking differences were to some extent verified in the study by Gallese, who scored his test in terms of a cut between 2 or less, and 3 or more reports of seen after-images, calling the former an "organic" and the latter a "normal" score. In 30 normal subjects, he found exclusively normal reactions, while in 41 schizophrenics he found 95 per cent. of normal reactions, thus substantiating previous findings that this test does not differentiate between normals and functional patients. An organic group consisting of 47 patients suffering from disorders other than those diagnosed alcoholic and convulsive disorders showed only 34 per cent. of normal reactions; another organic group consisting of 50 patients suffering from alcoholic and convulsive disorders showed 72 per cent. of normal reactions. Twelve lobotomized schizophrenics showed only normal reactions. The retest reliability of the score was found to be high, the fourfold point correlation between first and second testing on 34 organic patients being ·84, for two different examiners.

Gallese concludes that "with this method of inquiry, and of scoring, the test almost always indicates organicity when organic scores are obtained, although the converse is not true". He adds the observation that "it is . . . the author's belief that among the organics who obtained high scores the duration of the negative after-effect was considerably less than among the non-organics". Altogether, there appears to be considerable support for our deduction.

Little evidence is available with respect to the relationship of the length of after-effects and extraversion-introversion. In one small study 17 university students were administered a personality questionnaire and also tested on the Archimedes Spiral using 4 different periods of stimulation (10 seconds, 30 seconds, 50 seconds and two periods of 100 seconds, one of them preceding, the other following, the other three tests). Length of after-effect was measured in terms of the reports of the subjects as to when they ceased to see the after-effects. Figure 1 shows the mean scores of the 4 most extraverted and the 4 most introverted subjects; it will be seen that as predicted the introverts show a longer after-effect than do extraverts.

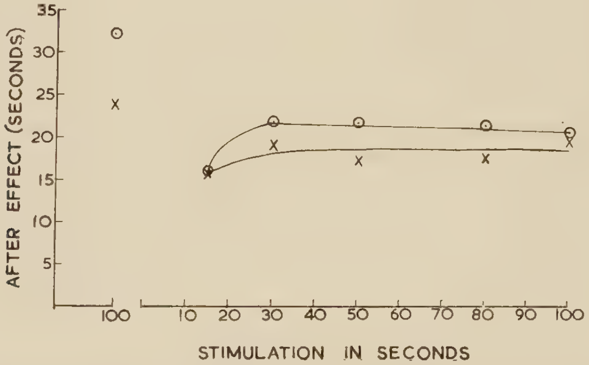

FIG. 1.—After-effect in seconds of stimulation by rotating spiral for groups of extraverts (crosses) and introverts (circles). Stimulation for 100 seconds was followed by a lengthy pause and then by successive stimulation for varying periods as indicated on the abscissa.

The spiral used in this experiment was a 4-throw spiral of 180°, this type having proved the most successful in several preliminary experiments. The spiral is 8¼ inches in diameter, subtending a visual angle of 6½ degrees. It is constructed of thick rigid cardboard and is rotated by an electric motor at a speed of 100 r.p.m. This speed was set initially by Strobe lamp and checked periodically, any slight variation being controlled by a variable resistance built into the circuit. (A photograph of the apparatus and spiral is given elsewhere (4).)

The disk can be rotated in a clockwise or an anti-clockwise direction depending on the position of a reversing switch. Illumination for the disk was provided by an Osram 100-watt pearl lamp, mounted 40 inches from the centre of the disk and 12 inches above it, thus being in the same direction but above the subject's line of regard. A fixation point was provided by the central, brass, locking nut of the spiral, which was polished by buffing.

We must now turn to the drug experiment. Each subject was given three treatments, on three different days; order of treatments was counter-balanced in the form of a double Latin Square.

1. D-amphetamine Sulphate, 10 mg.
2. Sodium Amylobarbitone, grains 4½.
3. Placebo.

Both drugs and placebo were in identically appearing capsule form and taken orally. Owing to the differential absorption rates of the drugs, testing of treatments 2 and 3 began one hour after administration and testing of treatment 1 began 1½ hours after administration. Subjects were instructed to rest until required.

Testing Procedure

The subject was seated on a hardwood chair, the front legs of which were six feet away from the spiral. As already noted, the spiral was illuminated and this was the only illumination in an otherwise completely darkened room. The following instructions were then read: "In a few moments I am going to rotate this disc and shall do so for one minute. During the time it is rotating I want you to keep your eyes fixed on that brass nut you see shining in the middle. At the end of one minute I shall stop the disc and you will see an after-effect having the appearance of a contraction or expansion coupled with a rotation in the opposite direction from that in which the disc was previously turning. I want you to merely say the word 'now' as soon as this expansion or contraction completely ceases."

When it was quite certain that the subject understood the instructions the motor rotating the disc was switched on and continued for a period of one minute (timing being done by stop-watch). At this point the motor was switched off and the stop-watch allowed to continue until the arranged signal was given. There followed a one-minute rest interval, during which the reversing switch was turned from "forward" to "reverse" and the second trial then began. The whole experiment consisted of four such trials.

Scoring is of the simplest kind; the time on each trial is taken in seconds and the mean of the four trials constitutes the score of that subject under that treatment.

Subjects

The total N in this experiment was six, being, with one exception, all postgraduate students of psychology. The exception was a senior technician in the Department of Psychology. The ages of the sample ranged between 25 and 39, with a mean of 29·5. There were five men and one woman.

Results

The prediction in this case was that treatment 2 (sodium amylobarbitone), being a depressant and thus an extraverting drug, would shorten the duration of the persistence of the after-effect relative to the "natural" level as assessed under treatment 3 (placebo), and that treatment 1 (d-amphetamine sulphate), a central excitant and thus an introverting drug, would lengthen it. Table II

TABLE II

Source	Degree of Freedom	S. Squares	Mean Squares	F	P
Replication	3	125·11	41·70	2·756	=<·05
People	5	2003·33	400·67	26·482	=<·001
Drugs	2	376·58	188·29	12·445	=<·001
Days	2	45·75	22·87	1·512	N.S.
Replication/Drugs	6	28·64	4·77	—	N.S.
Replication/People ..	15	213·56	14·24	—	N.S.
Residual	38	575·03	15·13	—	
Total	71	3368·00			

shows the results of an analysis of variance carried out to assess the significance of the differences between the scores. It will be seen that three significant F ratios emerge, namely, those for "replications", "people" and "drugs", the other main effect and the interactions remaining insignificant. Figure 2 shows the results in diagrammatic form.

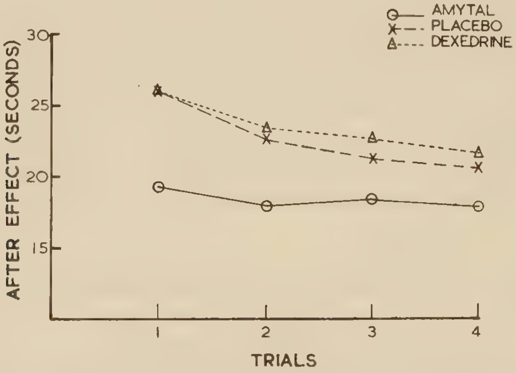

FIG. 2.—After-effects in seconds of stimulation by rotating spiral for group of subjects under drug treatment.

The fact that the replication term of the analysis reaches significance at the 5 per cent. level of confidence, coupled with the non-significant interaction of "replication" with "people" suggests that a consistent downward trend from trial to trial in the duration of the after-effect (23·83, 21·38, 21·16, and 20·27), might be interpreted as some form of practice effect, or that insufficient time was allowed between trials to permit the complete dissipation of inhibitory potential. The two remaining significant differences support the hypotheses tested, thus a P of ·001 confirms the main theoretical thesis that considerable differences exist between people (i.e. subjects), and finally a P of ·001 between drugs confirms the main drug hypothesis.

Further information was obtained by running t tests between treatments. Significant differences were found to exist between treatments 1 and 2 (i.e. dexedrine and amytal) and between 2 and 3 (i.e. amytal and placebo), both these differences invalidating the null hypothesis with a P=·001. The differences between treatments 1 and 3 (dexedrine and placebo) failed to achieve a level of significance which could be regarded as adequate.

This is an interesting result in that it supported a subjective opinion of the writers that dexedrine did not appear to have the same effect as an excitant, as amytal had as a depressant, with respect to the general behaviour of the subjects. There may be at least two reasons for this. The experimental design, though allowing for a differential absorption rate, may not have permitted sufficient time for the amphetamine to have its maximal effect. In a previous paper (3), it has been shown that "time since administration" has an important bearing on the effectiveness of this drug.

The overall results of the experiment are clearly favourable to our main hypothesis. If the experiment were to be repeated it might be advisable to test the effects of a stimulant drug after allowing a rather long period of time to elapse between administration and test.

SUMMARY

The prediction was made that stimulant drugs would increase the duration of visual after-effects while depressant drugs would have the opposite effect. Using the length of after-effects produced by a rotating spiral as our measure, six subjects were tested under three conditions, each on separate occasions. The three conditions were: (1) After administration of dexedrine; (2) After administration of sodium amytal; (3) After administration of a placebo.

The results showed that the sodium amytal had a highly significant depressant effect on the phenomenon studied, as compared with the placebo and dexedrine conditions. Dexedrine, while acting in the predicted direction, produced an effect which was not strong enough to reach full statistical significance.

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DRUGS AND PERSONALITY

IV. THE EFFECTS OF STIMULANT AND DEPRESSANT DRUGS ON THE RATE OF FLUCTUATION OF A REVERSIBLE PERSPECTIVE FIGURE

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In the first paper of this series (5), it was pointed out that one of the reasons why McDougall's (13) theory of drug action and personality was not accepted at all widely was connected with the fact that he failed to provide an objective, experimental test which could be used to diagnose extraversion-introversion, and to assess drug effects. This argument is not entirely correct; McDougall did in fact suggest one such test, namely the rate of fluctuation of so-called reversible perspective figures. Many varieties of these are known, and have been used experimentally; the Necker cube, the staircase, the vase-face, and the windmill patterns being probably the best known. In all of these, there is an ambiguity in the drawing which makes it possible to perceive two distinct patterns in the stimulus; on prolonged inspection these patterns alternate, and it is the rate of alternation, signalled verbally or by suitable mechanical arrangement, which constitutes the score on this test. It is known that different types of pattern give reasonably reliable scores, and also that rates of alternation on different patterns correlate quite highly together, thus demonstrating that one and the same tendency is being measured (15). That this tendency is of central rather than peripheral character is indicated by the fact that changes in the rate of reversal due to fatigue and other causes can be transferred from one eye to the other (2).

McDougall (13) put forward two main hypotheses: (1) Introverts are characterized by a fast rate of reversal, extraverts by a slow rate of reversal. (2) Stimulant drugs increase the rate of reversal, depressant drugs decrease the rate of reversal. We shall not go into the details of McDougall's neurological theory on the basis of which he made these predictions; it is highly speculative, and does not accord too well with modern views in the field. Nevertheless, a large body of research has been done in connection with these two predictions. With respect to the first hypothesis, linking personality with rate of reversal, Payne (15) has critically reviewed the literature and reports that results are "variable" where normal subjects are concerned. McDougall identified schizophrenia with introversion, manic depressive insanity with extraversion, and the evidence is on the whole in agreement in finding higher rates of reversal in schizophrenics than in manic depressives. However, even this conclusion

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* We are indebted to the Bethlem Royal and Maudsley Hospital Research Fund for support which made this study possible.

cannot be regarded as established, and in any case the hypothetical relation between schizophrenia and introversion has never been verified on an experimental basis.

As regards the effects of drugs, McDougall and Smith (14) claimed to have found confirmatory evidence, but it should be remembered that they only used 3 subjects, and that their research was rather unsystematic. Guilford and Braly (10) found a significant increase in the rate of reversal in 10 normal subjects of 2·32 fluctuations after alcohol; this is contrary to prediction. Three subjects tested under strychnine increased their rate of fluctuation, as predicted. Ewen (4) used a variety of drugs on schizophrenics and manic depressives, and claimed that the results were in accordance with McDougall's theory. George (9), working with 24 normal subjects, used sodium amytal and caffeine as his drugs and also reported positive results. On the whole, therefore, the second part of McDougall's hypothesis seems to have some empirical support, and it appeared worth while to repeat these investigations under somewhat more carefully controlled experimental conditions, and with the use of a somewhat more adequate design.

A further reason for repeating the experiment is linked with the fact that the present writers' theory of personality might be thought to give predictions exactly the opposite to those made by McDougall. There is some evidence that reversible perspective alternation is in part determined by satiation (3, 11), and the writer (8) has shown that, as postulated by his theory (7), extraverts (hysterics) show quicker and stronger satiation effects than do introverts (dysthymics). It would seem to follow that extraverts should show a faster rate of fluctuation, as well as a faster rate of change of fluctuation with time. (It is well known that the rate of fluctuation increases with time as the experiment progresses; this is possibly due to the accumulating effects of satiation which are not completely dissipated. Finally, inhibition reaches an asymptote, and no further change in rate of fluctuation takes place.) And it would also seem to follow that stimulant drugs should *decrease* both rate and change of rate, while depressant drugs should have the opposite effect. These predictions are of course contingent on the correctness of the theory linking reversible perspective fluctuation with satiation; the writer is not convinced that this explanation is in fact the correct one.

THE EXPERIMENT

The apparatus consisted of a viewing box and recording system. The distance from the subject to the figure was 48 inches. The cube outline was drawn on perspex, one-sixteenth of an inch thick and ground on both sides with fine lapping powder. It had a total size of 4½ cm., thus subtending an angle of 2° 6′. The lines were drawn with India ink approximately 1 mm. thick. Illumination came from a 15-watt Pigmy lamp 10 inches behind the screen on which the cube was drawn. A fixation point was provided in the centre of the cube outline. Recording was done by a telegraph key activating an event marker on an Evershed & Vignoles Recording Meter travelling at 12 inches per minute.

The subject was seated on a hardwood chair drawn up to a high table (36½ inches high). In front of him was the viewing tube of the apparatus, which was adjustable in height. On the table and directly in front of the subject was a telegraph key, located below the viewing tube. Before testing proper began the subject was asked to observe a large-sized Necker cube drawn in white on dark grey cardboard and the reversal phenomenon was explained to him. He was then instructed that each time such a reversal took place he was to depress the key in front of him.

When the subject had taken position the illumination behind the Necker cube was switched on simultaneously with the recording mechanism. Testing continued for a period of two minutes and at the end of this both recorder and illumination were switched off. There followed a rest period of approximately 10–11 minutes, and there was finally another Necker cube trial identical to the one described above.

Two scores were taken from each record, these being the average number of reversals per ten-second period and the change in rate which was found by subtracting the first three periods from the last three periods.

The subjects tested were the same as served in the experiment reported in a previous paper in this series (6). Drug treatments were also identical, so that we have six subjects each carrying out the experiment under three types of drug treatment—stimulant, depressant, and placebo. In fact, the experiment reported in a previous paper (6) was interpolated between the two runs of the present one. This point is important because in case of failure to verify McDougall's hypothesis it is useful to know that identical experimental arrangements (same subjects, same dosage, same drugs, same time elapsed since treatment) can produce highly significant effects in relation to another after-effect phenomena.

Results are shown in Table I. It will be seen that on the first administration, both stimulant and depressant drugs give rise to higher rates of reversal than does the placebo.* The same is true of the second administration; all three treatments give a greater number of reversals during the second period than during the first, but the amount of increase is approximately the same for all three treatments. This general increase is possibly due to satiation effects not entirely dissipated during the rest pause; it emerges in the analysis under the heading of "replication".

TABLE I

Subjects	1st Administration			2nd Administration			Combined Scores		
	Treatments			Treatments			Treatments		
	Placebo	Amytal	Dexedrine	Placebo	Amytal	Dexedrine	Placebo	Amytal	Dexedrine
1	2·16	1·91	1·83	2·26	2·16	2·83	2·208	2·041	2·330
2	3·66	2·91	4·60	3·50	3·41	4·75	3·583	3·166	4·708
3	2·58	1·50	1·91	3·58	4·91	2·18	3·083	3·208	2·041
4	2·66	1·33	3·58	3·75	2·25	4·58	3·208	1·791	4·583
5	2·08	2·50	1·91	2·50	2·08	1·91	2·291	2·291	1·916
6	5·08	10·92	7·08	7·58	10·83	9·25	6·333	10·875	8·166
Average ..	3·04	3·51	3·50	3·86	4·28	4·25	3·45	3·90	3·97

An analysis of variance was performed on the total scores; the results are reported in Table II. Two significant sources of variance appear, relating to people and days. In other words, there are consistent differences between people, and there is a consistent tendency for all people, and under all conditions of treatment, for number of reversals to increase from the first to the second, and from the second to the third occasion of testing. On the first day of testing, the

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* If it were to be established that both amylobarbitone sodium and dextro-amphetamine sulphate increased the rate of reversal, this would not necessarily be incompatible with the satiation theory. It is possible that peripheral factors such as eye movements may precipitate a reversal if a certain degree of satiation has already been built up, so that the phenomenon occurs sooner than it would have done if the gaze had remained fixed. Subjects under the influence of amytal find it more difficult to maintain their gaze (1), but there is only indirect evidence that dextro-amphetamine affects eye movements; however, the amphetamines usually increase motor activities (16, 17), and presumably the eye is similarly affected, although the only observation which may be relevant is that amphetamine increases reading speed (12).

TABLE II

Source	Degree of Freedom	Sum of Squares	Mean Square	F	P
Replication	1	4·7749	4·7749	4·3818	N.S.
Days	2	17·0446	8·5223	7·8208	1%
People	5	170·1645	34·0329	31·2314	1%
Drugs	2	1·8099	·9049	—	N.S.
Replication/Drugs ..	2	·0824	·0412	—	N.S.
Replication/People	5	3·3928	·6786	—	N.S.
Residual	18	19·6138	1·0897	—	—
Total	35	216·8829			

mean number of reversals was 2·91 per 10-second period; this rose to 3·80 and 4·59 during the second and third days. There thus appears to be a considerable and rather permanent practice effect which it would be difficult to account for in terms of undissipated satiation.

Drug and replication effects are not significant. The figures suggest that if a larger number of subjects had been used, the replication effect would have been significant; this indeed would be in good agreement with previous findings. It does not appear likely that the drug treatment would have emerged as significant even with such an increase in the number of subjects; the failure of the results to bear out McDougall's theory is in fact rather spectacular. A separate analysis was carried out on the "change of rate" figures, i.e. those derived from subtracting the scores during the first 3 ten-second periods from those during the last 3 ten-second periods. Again no drug effects were noted which could even be described as suggestive.

SUMMARY

McDougall's theory of the influence of stimulant and depressant drug action on the rate of fluctuation of a reversible perspective figure (the Necker cube) was submitted to an experimental test. No significant drug effects were found, and it was concluded that the results fairly decisively confirmed the original hypothesis.

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DRUGS AND PERSONALITY

V. THE EFFECTS OF STIMULANT AND DEPRESSANT DRUGS ON THE SUPPRESSION OF THE PRIMARY VISUAL STIMULUS

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IN a previous paper in this series (3), a brief discussion has been given of the theoretical reasons for anticipating that depressant drugs would shorten the perceptual after-effects of visual stimuli, and stimulant drugs would lengthen these effects. The present paper is concerned with a related type of prediction, also concerned with certain visual after-effects. The phenomenon in question was first observed by Bidwell (1, 2); it has not received much study, unfortunately, in spite of its great theoretical interest. The phenomenon is simply this. If a beam of red light (the primary stimulus, or S_p) is thrown into the eye of a person having normal colour vision, that person will report a red sensation, followed after the extinction of the light source by a series of after-images, usually in the complementary colour. The theory governing the appearance of the after-image is conventionally a photochemical one; the S_p produces certain effects in the retina which are opposite in direction for complementary colours and which are reversed when the S_p ceases to act on the retina. This reversal is perceived as the complementary after-image. Bidwell discovered that when the S_p is shown only for a relatively short period of time, say 20 milliseconds, and is immediately followed by a neutral stimulus, such as a beam of white light, then the S is not perceived at all, but only the complementary after-image. In other words, a red stimulus is perceived as green, a green stimulus as red. It is this perception of a non-existent stimulus which caused the phenomenon to be of such interest to psychologists.

No theory appears to have been suggested in the literature to account for this phenomenon, and before making any kind of deduction from our general drug and personality theory (4) on this suppression of the primary visual stimulus, we must suggest in outline at least a possible explanation of the phenomenon. This explanation makes use of the concept of pre-excitatory inhibition (6), i.e. the well-known fact that the excitatory phase of a visual stimulus is preceded by an exceedingly rapid inhibitory phase. This inhibitory phase "wipes off" the after-effects of preceding stimulation, as it were, and makes possible a greater distinctness of successive visual stimuli. Theories of this kind have in the past been applied to the phenomena of visual flicker, and it is worthy of note that correlations have been found between CFF and measures of primary visual stimulus suppression thresholds (7).

Our theory, then, accounts for the observed phenomena as follows. The red stimulus light sets up two effects. In the first place, it sets in motion a photochemical reaction which goes on as long as the stimulus continues; when

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* We are indebted to the Bethlem Royal and Maudsley Hospital Research Fund for support which made this study possible.

the stimulus ceases, this photochemical reaction is reversed. In the second place, the S_p sets up pre-excitatory inhibition (which is irrelevant to our theory), followed by a somewhat more slowly growing excitatory potential. This excitatory potential would be perceived in due course as *red*, but before that can happen the S_p is cut off, and followed by the white light. The cessation of the red stimulus produces post-excitatory inhibition, and the onset of the white light produces pre-excitatory inhibition; these inhibition effects make it impossible for the red to rise above the threshold of a sensation. Thus the failure of the primary visual stimulus to be perceived is explained.

The occurrence of the complementary visual after-effect is even easier to account for. When the red stimulus ceases to stimulate the retina, the photochemical process is reversed; this reversal, in accordance with the classical theory, is perceived as *green*, the complementary colour. As this reversal takes place *after* the post-excitatory inhibition due to the red light, and the pre-excitatory inhibition due to the white light have run their course, the green after-image is perceived without difficulty, although the simultaneous excitation produced by the white light somewhat attenuates its brilliance.

Given that this somewhat speculative hypothesis* is along the right lines, we may now deduce from our general drug hypothesis that depressant drugs will increase the inhibitory effects involved in the suppression of the primary visual stimulus, while stimulant drugs will decrease the inhibitory effects involved in the suppression of the primary visual stimulus. Thus the drugs in question should influence the time- and brightness-thresholds involved in the production of this phenomenon in opposite and predictable ways. The experiment here reported was carried out in an attempt to subject this hypothesis to an experimental check.

THE EXPERIMENT

Six subjects were used in the experiment, each being exposed to three drug treatments on three different days. Treatments were administered according to a pre-arranged scheme, making use of a double Latin Square design; in this way sequence effects were controlled and eliminated from the main comparisons. A description of the subjects has been given in an earlier paper, and the selection and dosage of the drugs used has been discussed there also (3). Depressant, stimulant, and placebo were all given in capsule form, identical capsules being used.

The apparatus used for the production of the visual stimuli has been described in detail, and shown photographically, elsewhere (5). It consists of a light source which throws a shaft of white light through a red filter (Ilford No. 609 Spectrum Deep Red Filter) into a viewing tube through which the subject inspects the stimulus monocularly. The beam of light is interrupted by a rotating disc, into which a small sector has been cut; this sector allows the red beam to pass for a variable period, depending on the speed of rotation and the size of the sector, before it is interrupted again by the solid disc. Pasted on to the disc, on the subject's side, is a piece of white paper illuminated by a white light source, giving a luminance of approximately 50 mL. The reflected light from this paper, which immediately follows the red light, constitutes the source of the hypothetical inhibition phenomena which eliminate the perception of the red light; omission to provide for the presence of the white light after the red eliminates the phenomenon under discussion completely.

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* It is important to be clear about the precise parts of this theory which are speculative. There can be little doubt about the inhibitory effects of the white stimulus following the red; these inhibitory effects are apparent *only* and *always* when a white stimulus of appropriate brightness and duration is administered after the red. What is speculative is the additional hypothesis that Granit's demonstration of the existence of pre-excitatory inhibition effects in the analysis of ERG records may be relevant to the observed relationships. This additional hypothesis is not necessary to our argument, and need not be accepted. Direct experimental evidence regarding the effects of drugs on the ERG is urgently needed to confirm or infirm this extension of our theory.

Two experiments were carried out. In both experiments the subjects had to vary the brightness of the red light, by means of a variac, in such a way that the short 20 msec. red flash was reduced in intensity until no more red at all was perceived in the viewing tube and the coloured flash was seen as being entirely green. The arbitrary variac setting number corresponding to the perception of "optimum green" was taken as the score.

In the first experiment, the 20 msec. red flash was followed by a 125 msec. white flash. For experimental purposes unconnected with the present study, a 225 msec. white flash was introduced *before* the red flash, separated from it by a variable length of no stimulation (black). These white flashes preceding the red flash at different intervals had no effect on the phenomenon, and may therefore be disregarded. The results of the experiment are shown in Figure 1. On the ordinate are given the variac settings, i.e. the brightness of the red stimulus at the point of "optimum green" in arbitrary units. On the abscissa are given the varying durations of the black interval separating the red flash and the preceding white flash. It will be seen that as predicted subjects under dexedrine have the lowest thresholds, subjects under amytal have the highest thresholds, while subjects under placebo are intermediate.

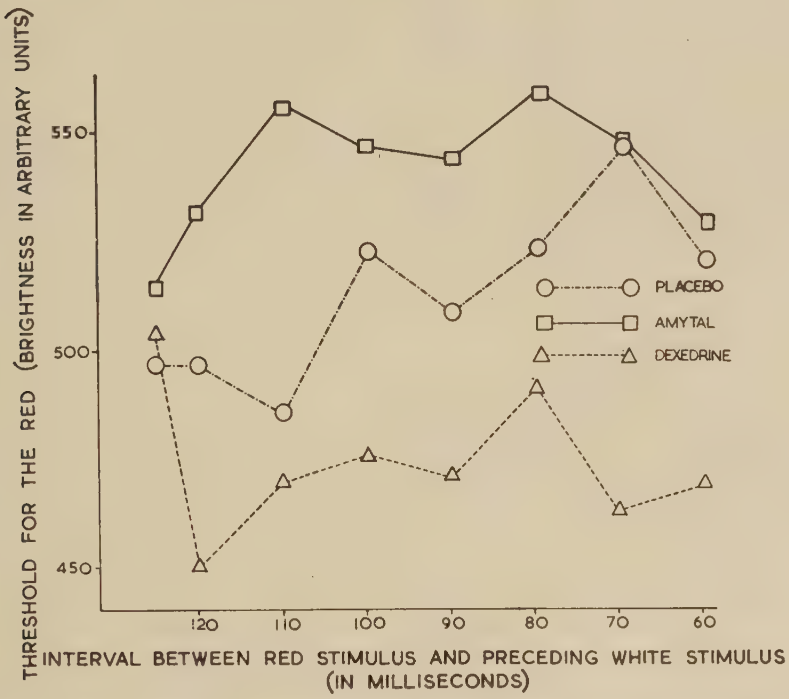

FIG. 1.—Threshold values for three drug groups plotted against interval between red stimulus and preceding white stimulus.

Table I

Source of Variation	d.f.	S.S.	V.Est.	V.R.	Significance
People	5	25438·6	5087·8	64·00	·01%
Days	2	1400·9	700·5	8·81	·01%
Treatments	2	3037·1	1518·6	19·10	·01%
Intervals	7	350·0	50·0	0·63	N.S.
Intervals/Treatments	14	692·1	49·4	0·62	N.S.
Intervals/People ..	35	3852·3	110·1	1·380	N.S.
Residual	78	6234·6	79·5	—	—
Total	143	41005·6			

Table I gives the numerical results of the experiments; it will be seen that the significant sources of variation, apart from the drugs, are people and days. The differences between people (individual differences) are not unexpected; the differences between days appear to be due almost entirely to the highly significant rise in the threshold from the second to the third day. Repetition of the experiment thus appears to work in the same direction as the administration of amytal.

T-tests were applied to the differences between the drugs, taken two at a time; these were all highly significant. The t-ratios are, respectively: Placebo vs. dexedrine—2·967; placebo vs. amytal—2·900; dexedrine vs. amytal—5·660. We may therefore conclude that the present experiment gives results very clearly in line with our hypothesis.

In the second experiment, a red flash of 20 msec. duration was followed by a variable length of white stimulation, from 40 msec. to 125 msec. The results of this experiment are shown in Figure 2; it will be seen that higher thresholds

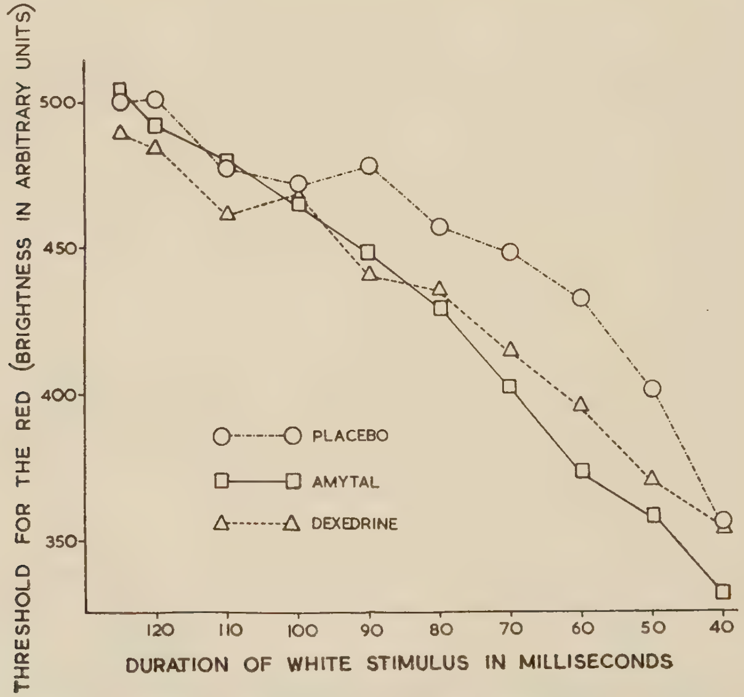

Fig. 2.—Threshold values for three drug groups plotted against duration of white stimulus following red stimulus.

are associated with longer durations of white regardless of drug used. Full results are given in Table II; all four primary sources of variation can be seen

TABLE II

Source of Variation	d.f.	S.S.	V.Est.	V.R.	Significance
People	5	7559·5	1511·9	39·48	·01%
Days	2	707·5	353·8	9·24	·01%
Treatments	2	554·2	277·1	7·23	·01%
Duration	9	11372·0	1263·5	32·99	·01%
Duration/Treatments	18	404·5	22·5	0·59	N.S.
Duration/People ..	45	1688·9	37·5	0·98	N.S.
Residual	98	3757·8	38·5	—	—
Total	179	26044·4	145·5	—	—

to have highly significant effects. Treatments, although the least effective, nevertheless give significant results. T-tests were applied to assess the significance of differences between pairs of drugs. The differences between dexedrine and amytal were not significant, but placebo produced higher thresholds than dexedrine (t=3·062) or amytal (t=3·504).

The result of this experiment is not in agreement with our hypothesis. Both dexedrine and amytal produced a lowering of the threshold, as compared with the placebo condition; this is correct for the dexedrine, but amytal had been expected to have the opposite effect. It will be noted that the effects which are contrary to expectation appear at low values of duration of the white flash; at 120 msec. the three drugs have sorted themselves into position as predicted. This is possibly important because in the first experiment we have shown that at 125 msec. the predicted effects occur at a high level of significance. Why the amytal should have paradoxical effects at low white flash duration values is not obvious to us; in so far as it fails to account for this effect the theory is obviously not yet complete.

SUMMARY

Two experiments were carried out to test predictions deriving from a general theory of drug action regarding the suppression of the primary visual stimulus. The first experiment supported the predictions at a high level of significance. The second experiment gave results with respect to placebo and stimulant drug which were in accordance with the theory, but the effects of amytal went counter to the theory. It was suggested that these contrary effects might be due to timing differences.

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CONFLICT AVOIDANCE IN OBSESSIONALS AND HYSTERICS, AND THE VALIDITY OF THE CONCEPT OF DYSTHYMIA

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I

THIS paper sets out to demonstrate similarities of behaviour between obsessionals and hysterics in responses to perceptual conflict, which might be expected on the basis of psycho-analytical theories, but which could not be predicted from the dimensional framework of personality favoured by Eysenck (1947, 1952, 1953) in which obsessionals and hysterics are found at opposite poles of an introversion-extroversion continuum, and in which anxiety states, depressives and obsessionals are grouped together in one indistinguishable category of dysthymia.

The data reported here form part of a larger investigation into what has been termed avoidance of ambiguity (Hamilton, 1956a, 1957). Its background may briefly be summarized as follows:

1. The term "intolerance of ambiguity" was applied by Frenkel-Brunswick (1949) to behaviour in perceptual tests, characterized by stimulus boundness, premature closure, oversimplified dichotomizing and a tendency towards black-white, either . . . or . . . solutions.
2. This cognitive approach had been found in association with a restrictive, repressor type of personality.
3. Investigations by Klein (1951, 1954) had demonstrated the existence of mechanisms of cognitive control from which consistent perceptual attitudes could be deduced and predicted.
4. These previous findings led to the consideration of avoidance of ambiguity as a consistent perceptual attitude found specifically in personalities characterized by strong mechanisms of control and restriction.
5. The latter mechanisms, according to psycho-analytic theories, particularly characterize the obsessional and hysteric personality.
6. Avoidance of ambiguity in the experimental tests particularized below, may be defined as the avoidance of perceptual conflict.
7. On this theoretical basis, nosological groups exhibiting a strong need to avoid emotional conflict might be expected to generalize this need to the perceptual sphere, and therefore avoid ambiguous situations and responses.

A difficulty arises out of the fact that at present psycho-analytic theory is not stated sufficiently precisely to allow the formulation of specific hypotheses.

It would seem valid, however, to pose certain questions on the basis of postulated psycho-analytic mechanisms, without assigning to them the strength of hypotheses. Empirical evidence obtained in the process of attempting to answer these questions would then provide justification for the formulation of specific hypotheses and evidence towards the general theory. The implications of such a procedure are simply that in the statistical analysis a two-tail instead of a one-tail test of significance is employed. No vital aspect of scientific rigour would seem to be lost, provided there is sufficient evidence to support the formulation of specific questions, though there may not be sufficient evidence to support one specific hypothesis to the exclusion of any other. At present there would appear to be a tendency to formulate hypotheses with very flimsy evidence to support them—which might better be described by the term "hunches".

The evidence from the literature suggesting that obsessionals and hysterics may avoid perceptual conflict, will be considered only briefly since the underlying theories are too well known to merit detailed treatment. Of basic relevance is the contention that neurosis represents a break-down in adaptation of the individual and his needs to the requirements of the environment. Whilst normal adjustment is demonstrated by an ability to face realistically the conflicts and anxieties associated with them, which are met in the process of adaptation, neurotics are characterized by their failure in this respect. A central mechanism found in neurotic behaviour is directed towards the handling internally of the need-environment conflicts rather than their solution in relation to external pressures and demands. The main objective is to defend the individual against obnoxious stimuli arising from conflicting and anxiety arousing situations (A. Freud, 1942). This aim, of the neurotic personality, is primarily achieved by avoiding and denying the presence of disturbing stimuli. In the anxiety states this mechanism appears to be inefficient or has broken down, in obsessionals it is demonstrated in restrictive and substitutive behaviour, whilst in hysteria, especially in conversion hysteria, it is considered operative in disabling somatic symptoms, dependence and indifference. In the last analysis, avoidance and defence mechanisms are considered operative in the control and avoidance of anxiety in which the behavioural and clinical symptoms play a leading part.

Fenichel (1945) would appear to give the most comprehensive account of the mechanisms underlying obsessional neurosis. In his system, the ego is seen to be defended by internal isolation of stimuli from their associated affects, by the processes of repression—first indicated by Freud (1926)—by reaction formations, and by limitation and constriction of the area of effective functioning. The behavioural concomitants of these processes are a daily routine which is circumscribed by time and energy-consuming rituals, prohibitions, compulsive acts and avoidance tendencies of phobic-like structure. The extent of the self-limitations of behaviour is probably most clearly demonstrated in the obsessional's apparent need to systematize his world, and to categorize and attach meaning to objects, ideals and emotions according to unvarying principles of classification. In this sense, obsessional doubt may be conceived as being operative in the service of cognitive and emotional perfectionism. Conflict avoidance is thus mediated by a process of stimulus classification. Few psychological investigations have been directed towards testing this assumption. A study by Rosenberg (1953) demonstrated the obsessional's preference for visual symmetry, a finding which may be considered suggestive evidence of the obsessional's classificatory attitude. The well-known study by Balken and Masserman (1940) gives further evidence of classificatory tendencies in obsessionals as they appear in the need to use a large number of words and especially a large number of adjectives when responding to TAT cards, in the need to qualify statements and in the need for certainty as implied in expressions of uncertainty.

The processes underlying conflict and anxiety avoidance in hysteria are perhaps most clearly formulated by Freud (1926):

> "The hysterical anti-cathexis is mainly directed outwards against dangerous perceptions. It takes the form of a special kind of vigilance, which by means of restriction of the ego, causes situations to be avoided that would entail such perceptions, or if they do occur, manage to withdraw the subject's attention from them. Some French analysts . . . have recently given this action of hysteria the name of 'scotomisation'."

This formulation probably correctly implies that the perception of conflict is dangerous, so that the latter would tend to be avoided by hysterics. This viewpoint would seem to rest on the theory of the symbolic significance of conversion symptoms. Again, there is little experimental evidence in support of the general theory as applied to hysteria. Of peripheral interest are the findings of Barron (1953) which suggest that preference for symmetry and simplicity in visual designs is found in association with hysteric traits.

On the basis of the available material, largely unsubstantiated in controlled experimental situations, it would appear permissible to suggest that neurotics (and obsessionals and conversion hysterics in particular) may be found to avoid experimental conflict situations. One method of approaching the problem would be to present such individuals with stimuli which by their nature or by experimental design are indeterminate and capable of dual interpretation. These requirements were considered to be present in the ambiguous stimulus situations chosen for the experimental battery of the present investigations. It was expected that neurotics—obsessionals and hysterics particularly—would avoid the conflict inherent in ambiguous stimuli or in the use of indecisive response categories, and that avoidance of perceptual conflict would be expressed by these groups by classifying tendencies and preference for perceptual structure and determinacy. If conflict avoidance through classification is considered to be present in both obsessional and hysterics, it becomes necessary to differentiate between the most prominent methods of classification: those of forcing stimuli into already existing categories, and the method of constructing appropriate new categories into which to place the stimuli. It was felt that these two methods may describe possible difference in conflict avoidance and classifying behaviour between obsessionals and hysterics over and above their general affinity, and an appropriate test situation was consequently introduced.

II

The study was carried out with 22 anxiety states, 20 obsessionals, 20 conversion hysterics and 40 normal control subjects. An ambiguous situation was defined as having double or dubious meaning, as being perceptually vague, unstructured and subject to fluctuation, as being of doubtful classification subjectively engendering uncertainty, doubt and hesitation, and as arousing perceptual conflict. The groups were equated for age and intelligence. Good psychiatric agreement was obtained for the predominant behavioural symptoms upon which subjects were selected (Hamilton 1956).

FIG. 1.—Summary of Tests, Response Categories and Instructions.

1. *Weight Discrimination Test:* 16 cans+1 standard. Subjects asked to compare stimuli and standard for weight. Response categories: "Heavier", "Lighter", "May be Heavier or Lighter, I can't decide which".
2. *Length Discrimination Test:* 16 lines+1 standard drawn on uniform cards. Subjects asked to compare stimuli and standard for length. Response categories: "Longer", "Shorter", "May be Longer or Shorter, I can't decide which".
3. *Brightness Discrimination:* 16 stimuli to be compared with a standard light source. Subjects asked to compare stimuli and standard for brightness. Response categories: "Brighter", "Dimmer", "May be Brighter or Dimmer, I can't decide which".

In each of the 3 discrimination situations 12 stimuli were objectively equal to, and 4 stimuli were clearly different from the standard. This was done to maintain a "set" for difference in subjects. They were told, however, that *none* of the stimuli were equal.

4. *Block Sorting Test:* 44 variously shaped and sized wooden blocks, to be sorted into "Circular", "Rectangular", "May be Circular or Rectangular, I can't decide which", and "To be sorted into separate groups afterwards" categories.
5. *Ambiguous Drawings:* Each of the 3 series of drawings laid out in random order before Subject. To be sorted into "Object A", "Object B" and "May be either Object A or Object B, I can't decide which" categories.
   (i) Sheaf-Tree series } designs incorporating simultaneously features of both objects.
   (ii) House-Car series } designs incorporating simultaneously features of both objects.
   (iii) Car-Dog series: largely amorphous drawings.
6. "*Ambiguity Scale*": 33 items to be "posted" into boxes marked "True" and "False". Example: "There is always more than one right way of doing anything".
7. *Reversible Perspectives:* (i) Rubin "Double Cross". (ii) "Necker Cube". Given under conditions of autonomous and controlled oscillations. A key, connected to an electrically operated counter, to be pressed with each change. Score=number of reversals per minute.
8. *Apparent Movement:* Subjects asked to say whether they experienced movement with varying stimulus intervals—direction of movement to be indicated.

Figure 1 gives a list of the tests used. In the Block Sorting Test subjects had to deal with mixed shapes, both circular and rectangular features being present in the same block. Two middle categories were provided here with the express purpose of differentiating between the classifying tendencies of obsessionals and conversion hysterics. One of these categories was a "Can't Decide" category, the other was a category giving the subject scope for sub-classifying later into as many categories as he liked. The prediction here was that, while obsessionals as well as conversion hysterics would avoid the conflict of a "Can't Decide" classification, the obsessional group would take advantage of the opportunity of sub-classification. Little needs to be said about the series of Ambiguous Drawings used here—they were patterned on the style used by Frenkel-Brunswick (1949) and Luchins (1945). The reversible perspectives—the "Double Cross" of Rubin and the "Necker Cube"—were given under both autonomous and controlled conditions of oscillation, in bursts of one minute each. In the apparent movement test, variable time intervals were presented three times in a fixed random order sequence under conditions of single exposure. The stimulus objects were two circular patches of light, the right one coming on after the left one, and no distinction was made between pure phi and optical movement. The Scale used in this study was aimed at the individual's differential need for definition and unequivocality in social situations.

Altogether 15 sets of results were obtained from the 11 tests. The basic and detailed data concerning the differences between the clinical groups and intra-individual consistency of perceptual attitude towards ambiguous situations are considered in detail elsewhere (Hamilton, 1956a, 1957). The Mann-Whitney U-test (1947) was applied in order to test whether the groups on each of the

FIG. 2.—Frequencies of Differences Between Sub-groups.

Significant differences	6	7	3	12
Non-significant differences	9	8	12	3
Groups compared	A & O	A & H	O & H	N & C

A=Anxiety States, O=Obsessionals, H=Conversion Hysterics, N=Neurotics, C=Normal Controls.

tests could have come from the same population. Figure 2 gives the frequency of significant and non-significant inter-group differences. In 75 per cent. of the test situations the difference in conflict/ambiguity avoidance between normal control and neurotic subjects was statistically significant in the direction of greater avoidance by the neurotic sample. Significant differences were found as frequently between anxiety states and obsessionals as between anxiety states and hysterics. On the other hand only 3 out of 15 tests of significance between obsessionals and conversion hysterics are shown to be significant. One of these differences, on the second middle category of the Block Sorting Test which provided opportunity for sub-classification, was specifically anticipated on the basis of theoretical considerations and experimental design concerning differences between obsessionals and hysterics in expressing their avoidance of conflict in stimulus classification. It may therefore, be concluded that the behaviour of obsessionals and conversion hysterics in terms of conflict avoidance is similar. In conversion hysterics this mechanism is mediated in part by the classificatory stimuli into few, mutually exclusive categories, whilst obsessionals would seem to classify extensively into a large number of smaller categories.

Special attention may be drawn to certain features of the apparent movement test. Only 40 and 45 per cent. respectively of conversion hysterics and obsessionals reported an impression of movement—the figure for the anxiety states was 68 per cent. In a separate analysis of the data, it was shown that subjects who did not receive an impression of movement generally avoided the ambiguous situations of the other tests more than those who "saw" the phi phenomenon. This may be taken as further confirmation of the similarities between obsessionals and conversion hysterics in response to ambiguity and perceptual conflict.

III

It is clear that these results and conclusions are at variance with the conceptual experimental and statistical framework that is usually associated with the work of Eysenck. In that framework obsessionals are grouped with anxiety states and depressives to form the dysthymic personality type which is contrasted with hysterics and psychopaths at the extravert end of an introversion-extraversion continuum.

Eysenck's scheme of classifying nosological groups into dysthymics, hysterics and psychopaths, may be considered from two aspects. The first of these deals with the usefulness of diagnostic classification in neurosis, or for that matter, in psychosis. It has become increasingly obvious that the textbook categories of the Kraepelinian system have lost their effective usefulness in that psychiatric opinion is rarely unanimous in its definition of a nosological category. Quite apart from the subjective element in diagnosis there are many difficulties concerning the boundaries of the various disorders and the implication of the diagnosis for the treatment and disposal of the patient. The experimental investigations initiated by Eysenck have so far dealt effectively only with the classifying aspect of the diagnostic problem. They would appear to represent the substitution of one system of mutually exclusive classification of clinical types for another. It is possible that the original intention may have been the isolation by experimental methods of true continua along which neurotics may be quantitatively differentiated. Examination of the diagrams with their orthogonal axes of introversion-extraversion, and neurosis-normality, which are intended to illustrate the concept of continuity, leads to disappointment in this respect.

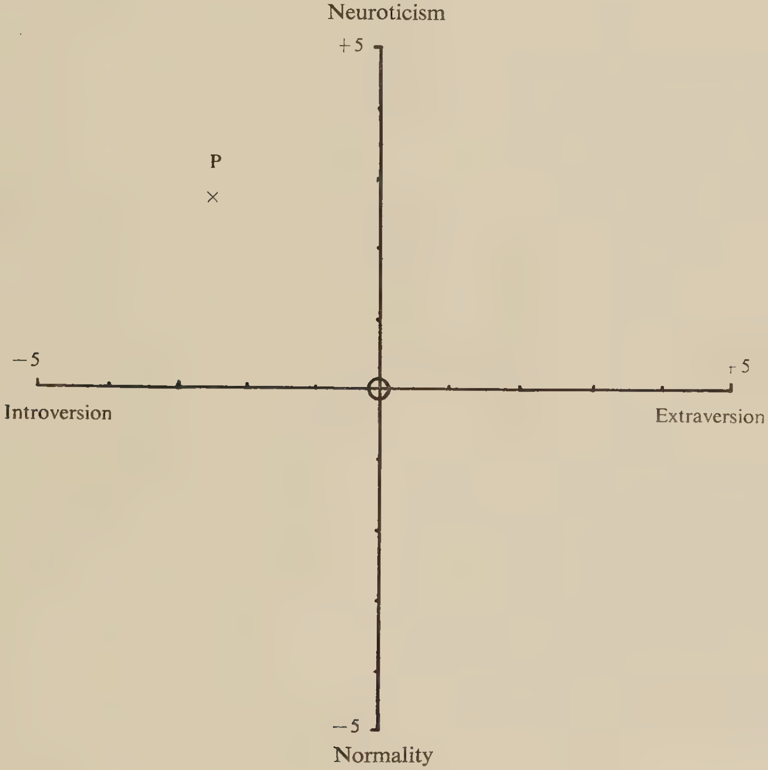

FIG. 3.

It will be clear from Figure 3 that the point of origin of the two co-ordinates is treated as a cut-off point which effectively, and presumably with qualitative considerations in mind, separates neurotics from normals, and dysthymics from neurotic extraverts. Since any point "P" within any two co-ordinates is defined in terms of those two co-ordinate scores alone, the opposite points of the co-ordinates add nothing to the description. This interpretation would seem to be supported by the practice of describing, in accordance with factor analytic methods, the point of origin as zero with positive *and* negative scales radiating from it. This practice may be considered a perpetuation of the old system of psychiatric diagnosis of assigning patients to mutually exclusive nosological groups. By contrast the real purpose of continuous dimensions may be considered to be a dual reference along the same axis in terms of its two opposite representative types. The following diagram may illustrate the point:

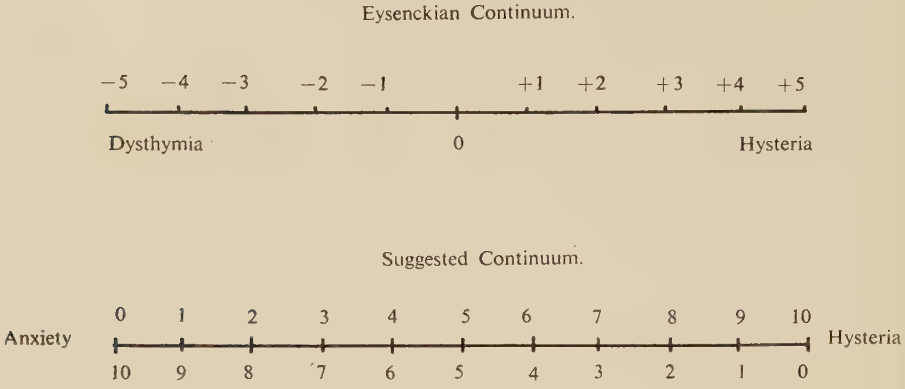

FIG. 4.

In Eysenck's system a group's position to the left of the point of origin is described in terms of dysthymia—to the right in terms of hysteria. On the alternative continuum description is in terms of overlapping scales of anxiety and hysteria: as one diminishes, the other increases. If theories of factorial analysis make no provision for this kind of continuum, it should not be beyond the ingenuity of statisticians to find a way out. This would be preferable to forcing the clinical facts into an inadequate system which does not do justice to them.

The second aspect of Eysenck's dimensional system to be considered here falls into two parts. There is firstly the argument of diagnosing patients on behavioural indices. It would seem to be helpful to reiterate that clinical diagnosis should have implications directed chiefly towards the description and treatment of the symptom and the subsequent disposal of the patient. For clinical purposes classification on the basis of symptoms alone is patently inadequate, because similar symptoms may have arisen for a variety of different reasons, so that the delimitation of underlying mechanisms becomes imperative. The Eysenckian system has only lately (1955), and very inadequately (Hamilton, 1956b), concerned itself with structural causal factors, while ignoring the functional aspect of symptoms. By contrast the investigation reported in the first part of this paper has attempted to stress functionally derived indices on which neurotics may vary. Whilst Eysenck's objective tests of personality have served the extremely useful purpose of introducing quantitative concepts into diagnostic psychological testing, they have been in the main re-descriptive. Since the tests have been validated against psychiatrically derived criteria of diagnosis which are often not very reliable, they are themselves unlikely to differentiate reliably between the diagnostic groups. Furthermore, since most of the objective tests do not correlate very highly with the psychiatric criterion, the error variance strongly suggests deficiencies in validity.

Eysenck frequently claims that he does not use a psychiatric criterion of diagnosis but an objective experimental one. The facts would seem to be that Guildford's Rhathymia Scale (Eysenck, 1955) particularly is being used as an external criterion of the dysthymia-hysteria dichotomy. This scale was originally validated against psychiatric diagnosis of unknown reliability and is therefore suspect on these grounds alone. Evidence has been presented elsewhere (Hamilton, 1956b) that the validity of the R-Scale is highly questionable, and that it does not, for example, differentiate reliably between hysteric and normal control groups. In general it would seem that, if tests are to be constructed for differentiating between nosological categories, three safeguards are necessary. Firstly the clinical diagnosis of the external criterion groups should be on the basis of behaviourally defined symptoms. Secondly, the extent of diagnostic reliability for each individual study should be ascertained by employing several selectors working on the basis of the same selection criteria. (These precautions were taken in the study reported in the first part of this paper.) Thirdly, before an objectively scorable psychological test is used diagnostically, it must correlate very highly with its own criteria of diagnostic validity; operationally defined symptoms or operationally defined psychological mechanisms, because however carefully these criteria are defined, they are bound to be deficient. It is, however, proposed to examine here only the evidence that led Eysenck to subsume anxiety states, depressives and obsessionals under the concept of dysthymia.

Eysenck's original taxonomic programme was concerned with establishing experimentally and statistically Jung's (1924) typology of introversion and extraversion. The intention was furthermore to show that introversion and extraversion were independent of neurosis. To those who are acquainted with Jung's writings it would appear from the start that such a programme was bristling with difficulties, because of what appear to be basic contradictions or perhaps lack of elucidation of his concepts by Jung himself. While Jung (*op. cit.*) states clearly enough that ". . . introversion has not the slightest connection with neurosis . . . ", he is equally specific in saying that introversion is characterized at the pathological end by psychasthenia, while extraversion is characterized in its morbid form by hysterical neurosis. Eysenck (1947) chose to test the hypothesis that introversion-extraversion vary independently with neurosis, and not the equally valid hypothesis that degree of introversion or extraversion is proportionate to degree of neurosis. The results of this earliest study (1947) are important for a number of reasons. Ratings on 39 items from a comprehensive Item Sheet were obtained for 700 neurotic military personnel. This check list was administered by psychiatrists using subjective methods of assessment, and was then factor analysed. In the table of factor loadings (Eysenck, 1947, p. 34) obsessionality was found in the same quadrant as anxiety and depression. This result determined the subsequent practice of subsuming anxiety states, depressive states and obsessionals under the concept of dysthymia. There might have been some justification for this procedure—though further evidence would have had to be obtained—if the experimental group had included a fair sample of obsessional neurotics. Of this there is no evidence. On the contrary it would appear that ratings on obsessionality are not ratings on obsessional neurosis. In Eysenck's (1947) study, obsessional symptoms were indicated in only 4 per cent. of the total number of cases. No evidence is available to suggest that these 4 per cent. were in fact diagnosed obsessionals. In view of the type of soldier tested, it is much more likely that the obsessional symptoms went with other *major* syndromes. If this should be the case, then the use of the term dysthymia as a collective for anxiety states, depressives and obsessionals is entirely unwarranted, for a category cannot describe particulars that are not included by it. Additional doubt is thrown on the meaning of a rating of obsessionality in the original check list (Eysenck, *op. cit.*) when it is considered that obsessionality had a zero loading on the orthogonal factor of neuroticism, whereas ratings on hysterical attitude in another quadrant had a loading of nearly ·4 on neuroticism. Since it cannot be seriously considered that an hysterical individual is neurotic but that an obsessional person is not, it may be concluded that either degree of "neuroticism" (in the factor analytic sense) is unrelated to severity of neurosis, or that the ratings on obsessionality represented ratings on obsessional features and not on obsessional neurosis *per se*. In view of these legitimate doubts, it is unfortunate that the homogeneity of the dysthymic category was in all subsequent investigations assumed without further question and testing. It can thus not be ascertained, for example, whether obsessionals behave like anxiety states or like hysterics on such measures of introversion-extraversion as: persistence, speed/accuracy ratio, dexterity or level of aspiration. This omission is to some extent rectified in a study by Hildebrand (1953) in which analyses of variance were carried out to test the significance of the over-all differences between the neurotic sub-groups. But again no separate inter-group tests of significance were made, presumably because the hypotheses of that investigation required only the experimental confirmation of the introversion-extraversion dimension. There would seem to be sufficient data available in Hildebrand's study, however, to reinforce any doubt concerning the validity of the dysthymic category.

Hildebrand (*op. cit.*) gave a large battery of tests to patients diagnosed as anxiety states, depressives, obsessionals, hysterics and psychopaths. The test situations were chosen because there were *a priori* and experimental grounds for believing that they would be able to differentiate between introverts and extraverts. Of the personality measures only Guildford's Rhathymia Scale, three scoring categories of the Suggestibility Test, and the Persistence Test showed an overall significant difference between the experimental groups.

On the Persistence Test, the scores of anxiety states were closest to the scores of psychopaths—an extravert group—but markedly dissimilar from obsessionals. A "Weighted Wrong Direction Score" on the Porteus Mazes Test, which has a significant loading on the introversion-extraversion factor and which differentiates significantly between a group of dysthymics and a group of hysterics and psychopaths, produces lower mean scores in obsessionals than in anxiety states, while the latter score almost the same as hysterics. Finally, it would seem that the validity of Hildebrand's (*op. cit.*) experimental battery may be seriously deficient, because in terms of factor scores on the introversion-extraversion factor, the normal control group is found to be more extraverted on the tests used than the groups of neurotic extraverts. This result though contrary to hypothesis was not considered in the discussion of Hildebrand's data by Eysenck (1955).

Further evidence inconsistent with the classification of neurotics into dysthymic and hysteric/psychopathic groups comes from the test situations where Hildebrand's (*op. cit.*) analyses of variance were not significant. This evidence may be grouped as follows:

(i) Measures on which obsessionals are closer to hysterics than to anxiety states: the Maudsley Medical Questionnaire, Annoyance Questionnaire, Extra-punitive Humour, Static Ataxia Test: maximum forward sway, total sway and number of reversals.

(ii) Measures on which anxiety states are closer to hysterics than to obsessionals: Sex Humour, Incongruous Humour, Guildford's T Scale, Porteus Mazes: starting time, tracing time, and weighted wrong direction scores.

Whilst not all these measures are considered to test primarily the introversion-extraversion factor, the inconsistency of the positioning of the sub-groups suggests that the assumptions underlying dysthymia may be unwarranted. No tests of significance between individual sub-groups were run by Hildebrand, so that it is not possible to say in which cases anxiety states and obsessionals, or hysterics and obsessionals were significantly different from each other. The many similar scores of anxiety states and hysterics, and of obsessionals and hysterics, strongly suggests that empirically found differences between dysthymics and hysterics may be a function of a particular test or of the particular psychological mechanism being tested rather than a function of a specific personality type. In view of the general inconclusiveness of the findings, the main criticism attaches to the limited number of variables submitted to investigation, especially the exclusion of those variables which might put the homogeneity of the dysthymic type to the test. It may be considered inadequate in view of Eysenck's (1947, p. 29) own diagrammatic representations of the hierarchical organization or structure of personality, to define a type in terms of only a few data at the trait level. The amount of error underlying conclusions based on such data is probably demonstrated in the small amounts of variance that have characterized the introversion-extraversion factor in the past.

It would appear then that similar test scores of anxiety states, depressives and obsessionals are the exception rather than the rule, even when testing those variables which appear to have only limited value for psychiatric treatment as distinct from diagnosis. There would appear to be a far greater need of objective psychological measures in the investigation of underlying mechanisms which may be considered as being of aetiological importance in anxiety, obsessionality, hysteria or depression and their behavioural concomitants. Such measures would eventually supersede the somewhat speculative interpretation of Rorschach scoring categories whose validity is frequently unestablished or questionable. The possibilities of one such measure—conflict avoidance—have been discussed above. As with intelligence testing the final aim in the measurement of personality may well be not a single categorical index of classification, but a profile extending over all psychiatric symptoms, from measures of physiological lability and reactivity to measures of anxiety and conflict avoidance. On such a profile affinities between the neurotic sub-groups would be entirely a function of the variable being investigated. The available data would appear to be entirely insufficient to maintain Eysenck's lack of differentiation between anxiety states, obsessionals and depressives by the use of the concept and the category of dysthymia. Furthermore, it may be felt that this classificatory procedure is of little value to the treatment and disposal of neurotic patients.

The present article is a more comprehensive version of a paper read to the British Psychological Society in April, 1956.

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A CLINICAL TRIAL WITH HYDROXYZINE (ATARAX) ON A GROUP OF MALADJUSTED EDUCATIONALLY SUBNORMAL CHILDREN

By

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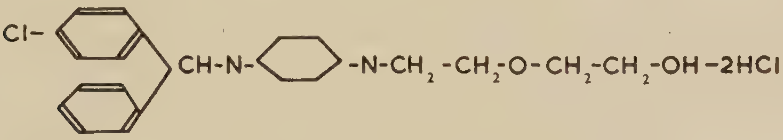
CHEMISTRY

CHEMICALLY hydroxyzine is one of a series of p-chlorobenzhydryl piperazine derivatives. It has a formula as follows:



LABORATORY STUDIES

In the course of pharmacodynamic studies in the laboratory it was discovered that rats receiving the drug soon became quiet but they retained their usual agility and alertness and responded to the threat of danger by flight.

It has been suggested that hydroxyzine acts by depressing the reticular formation of the brain stem.

Laboratory studies on animals were reported as follows:

Sedation

Oral administration of 50 mg./Kg. 20 minutes before the intraperitoneal injection of 75 mg./Kg. of sodium evipan in mice prolongs sleeping time by 260 per cent. However, intravenous injection of 40 mg./Kg. of hydroxyzine alone does not produce sleep in these animals; nor is sleep produced when 10 mg./Kg. of intravenous sodium evipan is preceded by subcutaneous injection of 25 mg./Kg. or oral administration of 200 mg./Kg. of hydroxyzine.

Muscle Relaxation

Intravenous injection of 10 mg./Kg. of hydroxyzine produces in 1 or 2 minutes hypotony of the legs of mice, affecting posture and lasting 3 minutes. Similar manifestations lasting 6 or 7 minutes are produced by 15 mg./Kg. in rabbits. Oral administration produces hypotony in mice beginning in 30 minutes and lasting 4 to 11 minutes with 20 mg./Kg.; and beginning in 8 minutes and lasting 20 minutes with 50 mg./Kg.

Toxicity

The LD50 values are:

Mice Oral 550 mg./Kg.; Intravenous 56; Intraperitoneal 137.
Rats Oral 690; Intravenous 81; Intraperitoneal 138.

Rats receiving 5, 10, 25 and 50 mg. of hydroxyzine per 100 Gm. of food for a period of 24 weeks compared favourably with controls in respect to food consumption and survival. Upon sacrificing the animals at the end of this period, histopathologic examination of heart, lungs, liver, spleen, kidneys, adrenals, stomach, intestines, pancreas and bone marrow revealed no abnormality attributable to the drug.

Clinical Studies

Bayart (1) states that the sedative action in man is similar to that observed in animal tests. Further he observed that in a group of children who showed mediocre scholastic results because of nervousness and instability the administration of hydroxyzine was of benefit. He found that their handwriting became neater, their attention was keener and more sustained and their application was enhanced. He states that digestive and general tolerance were perfect and he noticed the absence of somnolence and impairment of mental faculties. He reports no harmful effect on arterial tension. As far as the blood picture was concerned he reported that the number of red blood corpuscles and the haemoglobin index remained practically unchanged. The number of white blood corpuscles were slightly reduced, but this drop was transitory and in any case disappeared after a pause in, or the conclusion of, the treatment.

Farah (2) reported satisfactory therapeutic results in 5 cases of infantile neurosis. He reported that the toxicity was negligible and the side-effects were minimal and continual use did not seem to create dependence on the drug.

Heuyer (3) in his studies on the toxicity of the drug reported a decrease of the leucocytes mainly affecting the polynuclear cells with an increase of the eosinophils. The drop was transient in most cases and seemed to disappear in all cases when the treatment was discontinued. He reported that in 2 cases the drop was sufficient to cause him to discontinue the treatment. He found the results of treatment favourable in patients with inhibition, contact difficulties, timidity, apathy, abulia or on the contrary, verbal aggression or oppositionism.

Robinson (4) reported no abnormality in blood or urine after 6 weeks' treatment.

Shalowitz (5) reported no evidence of toxicity. Complete liver function tests and blood studies were made on all patients after 2 months therapy and no significant abnormalities were noted.

Scope of this Trial

The scope of this trial was to assess the value of the drug in a group of maladjusted educationally subnormal children, and to investigate the effect of hydroxyzine on the total white cell count and the differential count. These children were all under-functioning in that their educational attainments as measured by their ability to read and to carry out simple problems in arithmetic were well below their potential as measured by the Terman Merrill Intelligence Scale,

The children were all attending the same Residential School. Sixteen matched pairs were selected. They were matched for developmental age, sex, test quotient and degree of under-functioning. Each pair lived in the same villa, were in the same class and were being taught by the same teacher. Children showing evidence of the presence of an organic lesion were excluded from the test. Their ages ranged from 11 9/12 years to 15 10/12 years with a mean of 13 8/12 years: their I.Q.'s ranged from 56 to 81 with a mean of 66·9.

One of each pair was given 10 mg. hydroxyzine after breakfast and 10 mg. after the midday meal. The other of each pair was given a dummy tablet in appearance similar to the drug. This was continued for 3 weeks. At the end of this period all the children were given dummy tablets for 2 weeks, after which hydroxyzine and dummy tablets were administered as in the first period for a further 3 weeks.

It was decided that the blood picture would be checked at intervals during the 8-weeks trial.

All the children in both experimental and control groups were rated by the class teachers on 5-point rating scales for activity, application and progress in the basic subjects. Ratings were made for the week prior to and for the eight weeks of the trial. The teachers were also asked to give additional remarks to cover changes which could not be dealt with adequately by the rating scales. None of the raters knew which of the 32 children were receiving hydroxyzine or the dummy tablet.

RESULTS

Effects on the Children

It was intended to evaluate the results statistically by utilizing the information obtained from the rating scales. However these scales proved to be too crude a measure. Therefore it was decided to assess the results according to whether or not the children in the experimental group had improved as compared with the controls. In deciding whether or not a child had improved both his behaviour in class and his performance in basic subjects were borne in mind.

The teachers were asked to say which of the 32 children (16 on Treatment and 16 Controls) were receiving treatment. They were aware that 16 matched pairs had been selected, but they did not know which children had been matched, or who was receiving treatment. The results are shown in Table I.

TABLE I

	On Treatment	Controls
Teachers absolutely sure Receiving Treatment ..	4	–
Teachers reasonably sure Receiving Treatment ..	10	2
Teachers unable to decide	–	2
Teachers reasonably sure *not* Receiving Treatment ..	2	8
Teachers absolutely sure *not* Receiving Treatment ..	–	4

On enquiring why in 10 cases they felt reasonably sure and not absolutely sure the child was receiving treatment, it was found there had been a period when the child failed to maintain the initial improvement. This period coincided with the period when dummy tablets had been given, not only to the controls but also to the Trial Group.

At the end of the trial, before the identity of the matched pairs was disclosed, all 32 children were case-conferenced to ascertain changes in behaviour and school progress. Table II shows the distribution of these changes.

Table II

On Treatment		Control	
Improved	No Change	Improved	No Change
14	2	2	14

The cases were reviewed from the clinical standpoint to see if any specific disorder could be found in the type of case which responded to the treatment. It was found that the symptom pattern varied. The common feature which did seem to be present was a Tensional State, associated with awareness of scholastic failure. There was an apparent tendency for the children's reactions to become less abnormal; overactive children became less restless and distractible, and withdrawn children more sensitive to external stimuli. Psychosomatic manifestations were reduced or disappeared.

Details of four cases receiving treatment are given below:

Case Reports

Case No. 1

G.P., male, age 15 years 9 months. I.Q. 67. Grossly under-functioning, erratic, restless, distractible, responds badly to authority.

Extracts from Teacher's Observations

6th Week.—"Marked improvement in attitude to work and authority."

7th Week.—"All round improvement is being maintained and generally remarked upon. Very marked improvement in concentration."

8th Week.—"A fair degree of progress in reading has accompanied apparent personality improvement."

Case No. 2

P.F., male, age 12 years 3 months. I.Q. 66. Very disturbed boy, with a spasmodic torticollis and an "irritable colon", subject to temper tantrums, grossly under-functioning, reacts violently to slightest frustration.

Extracts from Teacher's Observations

2nd Week.—"Applied himself to Arithmetic Test without usual antagonism and accepted result with unusual equanimity. No obvious bowel symptoms this week."

3rd Week.—"Head twitchings, less noticeable. Very friendly."

6th Week.—"Twitchings of head almost completely absent. No temper tantrums." (Spasmodic torticollis returned after completion of treatment.)

Case No. 3

N.M., female, age 13 years 3 months. I.Q. 59. Withdrawn and disinterested, under-functioning.

Extracts from Teacher's Observations

1st Week.—"Rather more 'bubbly' than usual."

3rd Week.—"Restless in class but not over-active by more normal standards."

7th Week.—"On one or two occasions has worked really hard, and shown greater understanding of jobs tackled. At other times boisterous and giggly. Once or twice has been very disobedient."

8th Week.—"Rate of progress shows signs of improvement."

Case No. 4

R.W., male, age 13 years 3 months. I.Q. 71. Under-functioning, restless, irresponsible for his age, tends to withdraw from difficulties.

Extracts from Teacher's Observations

1st Week.—"Very sluggish and sleepy for three days. Certainly less talkative and more apparent concentration."

5th Week.—"No more sleepy days since first two weeks."

8th Week.—"Main improvement has been in behaviour, yet there was a period when application slackened. Was treatment suspended for a short period?"

Effects on the White Cell Count

The total white cell count and a differential count were taken on the 11th day, 32nd day, 39th day and at the end of the 8-weeks' trial. In addition a further count was taken 4 weeks after the termination of the trial (one case which left the school had to be omitted).

The total white cell count in no case was abnormally low, neither did the absolute number of neutrophil polymorphs fall below the normal range.

In half the cases there was a rise in the eosinophil polymorphs (to between 8·5 per cent. and 22 per cent.). The possibility that this might be due to parasitic infection, such as threadworms, was considered, but rectal swabs in suspicious cases failed to show any evidence of such an infection. Four weeks after the termination of the treatment the eosinophil polymorph count was back to normal levels except in one case. In this case the eosinophil polymorph count fell four weeks after the treatment was discontinued from 22 per cent. to 14 per cent. This is a case of recurrent asthma and it is likely that the rise in the eosinophil polymorphs may be due to factors other than Atarax.

In five cases there was a slight rise in the monocyte count (to between 10·5 per cent. and 15·1 per cent.) but 4 weeks after the termination of the treatment the counts were within the normal range.

The findings regarding the total white cell count and the neutrophil polymorphs are supported by the work of Bayart (personal communication), who treated 8 children with Atarax and found no reduction in the total white cell count or the neutrophil polymorphs.

SUMMARY

1. A clinical trial with Atarax was carried out on 16 matched pairs of educationally subnormal children who were maladjusted and under-functioning.

2. Improvements as measured by behaviour and performances in class were noted in 14 out of 16 on Treatment and in 2 out of 16 in the Control Group.

3. White Cell Counts and Differential Counts were carried out periodically. In no case was there a degree of Leucopenia or Granulopenia present to warrant interfering with treatment. A transient Eosinophilia and increase in the monocytes did occur but cleared quickly.

However, the number of cases was small and it is felt this drug should be controlled with White Cell Counts until more information is available.

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Bibliography and Epitome

VOL. 31 ACTA PSYCHIAT. NEUR. SCAND. 1956

Adrenocortical and Thyroid Function in Periodic Catatonia. *Gume, L.-M., and Gemzell, C. A.* 367
Enuresis. I. *Hallgren, B.* 379
Enuresis. II. *Hallgren, B.* 405
A Comparison between Combined Reserpine-Chlorpromazine and Chlorpromazine Therapies in Psychiatry. *Hormia, A.* 437
An Attempt at Evaluating the Contents of the Concept of Actual Neurosis. *Højer-Pedersen, W.* 447
Colorimetric Estimation of Succinic Dehydrogenase Activity in the Rabbit Brain with Tetrazolium Salt. *Kawakita, Y.* 459
Adrenalin- and Mecholyl Test Performed in Schizophrenia and Schizophreniform States. *Laane, C. L.* 467

VOL. 61 AM. J. MENT. DEFIC. JANUARY, 1957

Reserpine and Chlorpromazine in Hyperactive Mental Defectives. *Horenstein, S.* 525
The Excretion of β-Aminoisobutyric Acid in Normal, Mongoloid and Non-Mongoloid Defective Children. *Wright, S. W., and Fink, K.* 530
Infantile Spastic Hemiplegia Intelligence, and Age of Walking and Talking. *Perlstein, M. A., and Hood, P. N.* 534
The Concept Propfschschizophrenia and its Prognosis. *Lanzkron, J.* 544
The Performance of Schizophrenic, Retarded and Normal Children on the Bender-Gestalt Test. *Goldberg, F. H.* 548
A Comparison of Two Types of Learning in Mental Defectives. *Sloan, W., and Berg, D. A.* 556
Ethnocentrism and Intolerance of Ambiguity in Mentally Retarded Children. *Rosenblum, S.* 567
The Relationship of Auditory Memory Span to Learning Ability in High Grade Mentally Retarded Boys. *Keller, J. E.* 574
Digit Span and Anxiety. *Callahan, R. J., and Keller, J. E.* 581

VOL. 113 AM. J. PSYCHIAT. DECEMBER, 1956

Genetic Principles in Human Populations. *Muller, H. J.* 481
The Molecular Basis of Genetics. *Panting, L.* 492
The Genetics of Human Behaviour. *Kallmann, F. J.* 496
Discussion of the Genetics Symposium. *Brosin, H. W.* 502
Discussion of the Genetics Symposium. *Glass, B.* 504
Letter from Germany. *Roeder, F. D.* 506
Neurophysiologic and Pharmacologic Influences on Experimental Neuroses. *Masserman, J. H., and Pechtel, C.* 510
Therapeutic Results in Mental Hospitals with a Minimum of Professional Personnel. *Bartemeier, L. H.* 515
The Problem of Ambulatory Schizophrenics. *Zilboorg, G.* 519
Anxiety Problems within Cultural Settings. *Appel, K. E.* 526
*The Ataractic Drugs. *Bones, H. A.* 530
*A Two-year Evaluation of Chlorpromazine in Clinical Research and Practice. *Malitz, S., et al.* 540
*Methyl-Phenidylacetate Hydrochloride (Ritalin) in the Treatment of Chronic Schizophrenic Patients. *Carey, B., et al.* 546
Ways of American Psychiatry. *Rocha, J. S.* 548
Advances in Management and Treatment of European Mental Hospitals. *Kalinoswsky, L. B.* 549

The Ataractic Drugs: the Present Position of Chlorpromazine, Frenquel, Pacatal, and Reserpine in Psychiatric Hospital

The ataractic drugs are so called from their ability to produce ataraxy: freedom from confusion and anxiety. In a veterans' psychiatric unit of 550 beds with a high rate of admissions and discharges, chlorpromazine and reserpine have been intensively studied during the past 2 years and since June, 1955, Frenquel has been given to 130 patients, and Pacatal to over 250, in an effort to clarify the indications for these ataraxics in the treatment of acute and chronic psychoses.

The experiences with Frenquel are described in some detail as the originally hopeful and eventually disillusioning results obtained may explain many ambiguous findings in this complex field of research. Frenquel appears to have anti-hallucinatory and physically tonic effects in a small minority of regressed schizophrenics but to be of no value in the treatment of acute psychoses. Reserpine has also failed to fulfil earlier expectations. It is now reserved for the tranquillization of arteriosclerotics and as an adjuvant in the psychotherapy of some withdrawn schizophrenics.

Pacatal, a phenothiazine derivative recently developed in Europe, and chlorpromazine are virtually interchangeable and synergistic. Pacatal is almost twice as strong a tranquillizer but a weaker hypnotic. It is mildly euphoriant and strongly parasympatholytic unlike chlorpromazine, a sympatholytic and depressant. Both are indicated in the symptomatic relief of psychomotor excitation, aggression, destructiveness, restlessness, and tension in acute and chronic psychoses. A combination of both, in which their mutually antagonistic autonomic effects reduce the incidence of complications and abolish the Parkinsonian syndrome, is yielding promising results.

In this study these drugs have significantly reduced the need for E.C.T. and lobotomy without replacing these valuable methods of treatment. The seclusion of disturbed patients has been reduced to one-tenth. Since July, 1955, insulin coma therapy has been replaced by group psychotherapy using ataraxics as adjuvants. Over twice the number of patients can be treated, so far with better results. The discharges during 1955 outnumbered the admissions; the hospital atmosphere is calmer, and there is increased confidence and optimism. These latter factors cannot be ignored.

Alone, ataraxics merely modify symptoms but in conjunction with psychotherapy they open up wide vistas of therapeutic promise.

(Author's Abstr.)

A Two-year Evaluation of Chlorpromazine in Clinical Research and Practice

In conclusion, it is believed that chlorpromazine has established itself as a useful therapeutic tool in the treatment of mental illness. It is a relatively safe drug, and although the side-effects are many, serious or permanent sequelae are almost unknown. In regard to its therapeutic effect in our case material much is left to be desired. Its range of application appears to be narrow, being most effective in agitated, hyperactive, and overtly anxious patients, with much more limited value in depression, or with obsessive patients manifesting little or no increase in motor function. It is palliative rather than curative. It can intensify anxiety and precipitate depression and psychotic symptoms as well as alleviate them. Its major advantage lies in its tranquillizing action without accompanying marked drowsiness or confusion. Its value as an adjunct to psychotherapy is still to be evaluated.

Chlorpromazine has been a major force in firmly launching us into the era of psychopharmacology. We are still suffering, however, from all the uncertainties and hesitation of a pioneer venture. This should not deter us from continued investigation and progress.

(Authors' Abstr.)

Methyl-Phenidylacetate Hydrochloride (Ritalin) in the Treatment of Chronic Schizophrenic Patients

In this group of 50 chronic schizophrenic patients, half of whom received Ritalin and half an identical appearing placebo the Ritalin was without demonstrable effect. Six of those on Ritalin showed a decrease in appetite, abdominal discomfort, and weight loss during the test.

(Authors' Abstr.)

VOL. 76 **ARCH. NEUR. PSYCHIAT.** DECEMBER, 1956

Studies on Headache. *Richler, E., et al.* 571
Hydranencephaly. *Alexander, E., jun., et al.* 578
Relationship Between the Wernicke and the Korsakoff Syndrome. *Malamud, N., and Skillicorn, S. A.* 585
Early Ambulation and Psychotherapy for Treatment of Closed Head Injury. *Müller, R., and Naumann, B.* 597
Lipoprotein Patterns of Spinal Fluid Obtained by Electrophoresis. *Smith, J. K., et al.* 608
*The Time Sense. *Lhamon, W. T., and Goldstone, S.* 625
*Glutathione Levels in Mental and Physical Illness. *Martens, S., et al.* 630
*Studies of the Role of Ceruloplasmin and Albumin in Adrenaline Metabolism. *Leach, B. E., et al.* 635
Receptor Preferences in Schizophrenic Children. *Goldfarb, W.* 643
*EEG During E.C.T. with Succinylcholine. *Piekenbrock, T. C., et al.* 653
Discharge and Readmission Among Mental Hospital Patients. *Wanklin, J. M., et al.* 660
Physiologic Stress Response Evaluation by Focused Interviewing, *Cohen, S. I., et al.* 670
*Chlorpromazine and Hepatic Function. *Kinross-Wright, V., and Moyer, J. H.* .. 675

The Time Sense

Thirty-seven schizophrenic patients were compared with 41 control subjects with respect to their estimation of one clock second's duration. It was found that the group of patients had a significantly smaller second estimation point (SEP) when tested by a "passive" method than did the control group. Patients and control subjects were surprisingly stable in their estimates. The effect of providing information of the actual duration of a clock second was studied in both groups. The relation of these findings to the psychopathology of schizophrenia is briefly discussed.

(Authors' Abstr.)

Glutathione Levels in Mental and Physical Illness

The authors' findings of lower levels of reduced GSH in schizophrenics than in normals confirm reports of other workers. This finding is not specific for schizophrenic patients, since we find it also in patients with various intercurrent diseases. There appears to be a relationship between lower GSH levels and high levels of serum globulin. These results are compared with those which we reported earlier regarding the speed of adrenaline oxidation. In that study, many patients without psychosis, but with other disease processes, similarly showed changes characteristically seen in psychotics. In some instances, however, where adrenaline metabolism was altered, the GSH levels were in the normal range. The question whether the same enzymatic system may affect both indicators, or whether they are more indirectly related to each other, is discussed. Further explorations of the role of ceruloplasmin and/or closely related substances in association with these biochemical abnormalities are presented in a separate paper.

(Authors' Abstr.)

Studies of the Role of Ceruloplasmin and Albumin in Adrenaline Metabolism

In this study the authors have attempted to isolate those substances which influence the speed of oxidation of adrenaline as determined in an *in vitro* test. Data presented indicate that ceruloplasmin, a copper globulin, is the important oxidizing substance and that albumin is an active inhibitor of this process.

(Authors' Abstr.)

EEG During Electroconvulsive Therapy with Succinylcholine

Electroencephalographic tracings were made on 15 psychiatric patients during electroconvulsive therapy premedicated with thiopental sodium and atropine and immobilized with succinylcholine.

The electroencephalographic changes consisted in the appearance of (*a*) high-voltage slow waves mixed with fast activity after thiopental sodium and atropine; (*b*) a transitory burst of muscle after succinylcholine, followed by disappearance of all muscle activity; (*c*) fast activity, followed by spike and wave patterns with a strong 3-per-second spike-dome component following electroconvulsive treatment; (*d*) a flattening of all activity with or without administration of oxygen 30 seconds after stimulation; and (*e*) irregular high-voltage slow waves during the stupor period.

(Authors' Abstr.)

Chlorpromazine and Hepatic Function

The hepatic function of 30 medical and 33 psychiatric patients under treatment with chlorpromazine was studied.

No changes were found, and it is considered that routine liver function tests are of no value for predicting the development of hepatotoxicity.

The etiology of jaundice following chlorpromazine and other drugs is discussed, and two case histories are presented.

(Authors' Abstr.)

VOL. 79 **BRAIN** DECEMBER, 1956

The Babinski Plantar Response. *Walshe, F. M. R.* 529
Cough Headache. *Symonds, C.* 557
Cerebral Dominance in Sinistrals. *Ettlinger, G., et al.* 569
Disorders of Laughter due to Brain Lesions. *Ironside, R.* 589
A New Congenital Non-progressive Myopathy. *Shy, G. M., and Magee, K. R.* .. 610
Cysticercosis of the Posterior Fossa. *Bickerstaff, E. R., et al.* 622
Observations on the Prevalence of Multiple Sclerosis in Northern Scotland. *Sutherland, J. M.* 635
Habituation of the Arousal Reaction. *Sharpless, S., and Jasper, H.* 655

VOL. 17 **DIS. NERV. SYST.** DECEMBER, 1956

The Arnold-Chiari Malformation without Spinal Dysraphia. *Jackson, I. J., and Hoffman, G. T.* 375
Monopolar E.C.T. Coma for "Hard-core" Cases. *Epstein, J., and Campden-Main, B. C.* 379
N-Methyl-A,A-Methylphenylsuccinimide in Psychomotor Epilepsy. *Cordoba, E. F., and Strobos, R. R. J.* 383
Medicolegal Aspects of the Doctor-Patient Relationship. *Siegal, L. J.* 386
Neurotic Aversion to Kissing. *Bergler, E.* 391
Clinical Evaluation of Ritalin. *Natenshon, A. L.* 392

VOL. 59 **FOL. PSYCHIAT. NEUR. NEUROCHIR. NEERL.** AUGUST, 1956

Steering under Abnormal Circumstances. *Bok, S. T.* 303
Hypothalamic Syndromes in General and Disturbances in the Water Regulation in Particular. *Biemond, A.* 338
Relationship Between the Central Nervous System and the Thyroid Gland. *Querido, A.* 359
Temperature and Heat Regulation. *Verbiest, H.* 363
Some Functions of the Hypothalamic-hypophysial System in Relation to the Pathology. *Prick, J. J. G.* 408

OCTOBER

Some Remarks on a Common Disorder "Occupational Inhibitions". *van Dijk, W., and Kuiper, P. C.* 485
A New Psychological Approach to the Concept of the "Epileptic Personality". *Ceha, M. M. T., and Boeke, P. E.* 499
Some Remarks on the So-called "Spastic" Gait. *Tan, B. K.* 508
Pathological Jealousy and Jealous Delusions. *Tiggelaar, J.* 522

VOL. 54 **GENET. PSYCHOL. MONOGR.** NOVEMBER, 1956

The Influence of Social Context on Impulse and Control Tendencies in Preadolescents. *Zuk, G. H.* 117
Tender-mindedness versus Tough-mindedness in Psychology. *Winthrop, H.* 167
A Method for the Comparison of Groups. *Schaw, L. C., and Henry, W. E.* 207

VOL. 37 **INTERNAT. J. PSYCHO-ANAL.** 1956

The Development of the Ego Concept in Freud's Work. *Hartman, H.* 425
Re-evaluation of the Process of Working Through. *Greenacre, P.* 439
On Some Vicissitudes of Insight in Psycho-analysis. *Kris, E.* 445
The Role of Identification in Psycho-analytic Procedure. *Groot, J. L.* 456
Some Remarks on the Role of Speech in Psycho-analytic Technique. *Loewenstein, R. M.* 460
The Nature and Function of the Analyst's Communication to the Patient. *Rycroft, C.* 469

VOL. 105 **J. COMP. NEUR.** SEPTEMBER, 1956

Research on the Regeneration of the Spinal Cord in the Cat Submitted to the Action of Pyrogenous Substances (5 OR 3895) of Bacterial Origin. *Arteta, J. L.* 171
Action of the Pyrogenous Substances (5 OR 3895) on the Regeneration of the Peripheral Nerve. *Arteta, J. L.* 185
*A Study of the Red Nucleus in the Rhesus Monkey. Anatomic Degenerations and Physiologic Effects Resulting from Localized Lesions of the Red Nucleus. *Carpenter, Malcolm B.* 195
Components of Splanchnic and Intermesenteric Nerves. *Kuntz, Albert* 251
The Neural Pattern of the Epiglottis. *Feindel, William* 269
The Central Tegmental Bundle. An Anatomical and Experimental Study in the Monkey. *Bebin, Jose* 287
Myelin Sheath During Degeneration and Regeneration. II. Histochemistry. *Noback, Charles R., and Reilly, James A.* 333

A Study of the Red Nucleus in the Rhesus Monkey. Anatomic Degenerations and Physiologic Effects Resulting from Localized Lesions of the Red Nucleus

An attempt was made to produce localized stereotaxic lesions of the red nucleus in a series of 25 rhesus monkeys in order to study the resulting physiologic effects and anatomic degenerations. Animals were carefully observed before and after surgery; cinematographic records were taken of noteworthy physiologic phenomena. Serial sections of the brains and portions of the spinal cords of these animals were stained according to the Marchi technique; every 10th section was mounted.

Localized red nucleus lesions were produced in 12 monkeys; such lesions were considered worthy of detailed analysis in 10 animals. Lesions were considered unilateral if more than 15 per cent. of the total volume of the red nucleus was destroyed on one side and bilateral if more than 15 per cent. of the volume of the red nucleus was destroyed on each side. According to this criterion, 5 animals had unilateral lesions and 5 had bilateral lesions. Percentile volumes of the red nucleus destroyed in these animals varied from 1·7 to 51 per cent. The percentile volumes of the red nucleus destroyed in animals with unilateral lesions averaged 26·6 per cent. and 27·2 per cent. in those with bilateral lesions. The following conclusions were drawn:

1. Fibers originating in the red nucleus project ipsilaterally to the arcuate nucleus of the thalamus via the thalamic fasciculus. Such fibers appear to arise from both the rostral and caudal halves of the red nucleus.

2. Fibers originating in the red nucleus project to the globus pallidus via the ventral division of the ansa lenticularis. These fibers arise from both rostral and caudal halves of the red nucleus and appear to be mainly uncrossed.

3. Fibers originating in the caudal half of the red nucleus project to the ipsilateral subthalamic nucleus.

4. The possibility that some fibers originating in the red nucleus project to the contralateral arcuate nucleus of the thalamus, the globus pallidus and the subthalamic nucleus could not be excluded.

5. As a result of localized lesions in the red nucleus ascending Marchi degeneration also can be followed into the lateroventral nucleus of the thalamus and into the globus pallidus via the dorsal division of the ansa lenticularis on the same side as the lesion. Degeneration in these sites is the same as that produced by lesions of the opposite brachium conjunctivum below the red nucleus.

6. Lesions of the red nucleus frequently produce transient tremor (simple and ataxic), ataxia and cerebellar asynergia which disappears without residuum.

7. Bilateral lesions of the red nucleus provoked marked hypokinesis which is enduring, but does not impair the quality of motor performance.

8. Unilateral or asymmetrical lesions of the red nucleus may provoke rotation and tilt of the head to the side opposite the lesion (or the larger lesion in the case of bilateral lesions). This physiologic effect may be of brief duration or persist until death or sacrifice.

9. Neither tremor, ataxia nor cerebellar asynergia phenomena of an enduring nature result from well localized lesions of the red nucleus, although significant portions of the crossed ascending limb of the brachium conjunctivum are interrupted by such lesions.

The hypothesis is presented that tremor (simple and ataxia), ataxia and cerebellar asynergic phenomena do not result from lesions interrupting the crossed ascending limb of the brachium conjunctivum at the level of the red nucleus or above.

(Author's Abstr.)

VOL. 19 **J. NEUROPHYSIOL.** NOVEMBER, 1956

*Somatic Afferent Areas I and II of Dog's Cerebral Cortex. *Hamny, T. P., et al.* .. 485

*Role of Auditory Cortex in Discrimination Requiring Localization of Sound in Space. *Neff, W. D., et al.* 500

The Direct Cortical Response. *Ochs, S.* 513

Ventral Root Discharge in Response to Vestibular and Proprioceptive Stimulation. *Andersson, S., and Gernandt, B. E.* 524

Sensory and Motor Localisation in Cerebral Cortex of Porcupine. *Lende, R. A., and Woolsey, C. N.* 544

Suprasegmental Inhibition of an Autonomic Reflex. *Wang, G. H., and Brown, V. W.* 564

Nature of Dendritic Potentials and Synaptic Mechanisms in Cerebral Cortex of Cat. *Purpura, D. P., and Grundfest, H.* 573

Somatic Afferent Areas I and II of Dog's Cerebral Cortex

1. Somatic afferent areas I and II (SI and SII) of the cerebral cortex of the dog have been mapped by the evoked potential method, using mechanical movement of hairs or light pressure to the skin as stimuli.

2. The body surface is so represented in SI that the animal appears to be lying with tail and postaxial thigh on the medial wall of the hemisphere and the preaxial thigh on the dorsal surface; the back of the animal and the occipital aspect of the head fall along the caudal margin of the area, toward the visual cortex; the ventral surface of the trunk, the apices of the limbs and the snout are directed rostralward. There is continuity of foci for trunk, neck and face, but not for tail and trunk. In general, the arrangement is similar to that previously described for the rat. The area is activated only by stimulation of the contralateral half of the body, except for a special portion of SI, the ipsilateral face area, which forms the rostral part of the face area.

3. SII has been found to possess a high degree of somatotopic differentiation, in contrast with earlier reports for this area in other species. The localization pattern is such that the back of the animal lies inferiorly, along the dorsal border of the insula, while the limbs and face extend upward over the anterior ectosylvian gyrus toward SI, with the snout most rostral and the foot most caudal. The area can be activated by stimulation of both sides of the body, responses to ipsilateral stimulation being approximately half as large as those to contralateral stimulation.

4. Tunturi's third auditory area lies within the face subdivision of SII.

(Authors' Abstr.)

Role of Auditory Cortex in Discrimination Requiring Localization of Sound in Space

1. Cats were trained to make a response requiring localization of sound in space. Lesions were then made in the cortical projection areas of the auditory system.

2. After bilateral ablation of AI and, in some cases, of AII and Ep, a severe deficit in performance was found. In contrast, response to visual cues in the same situation was readily

learned, and control animals with ablation of non-auditory cortex retained the sound-localization habit and showed no deficit in performance.

3. Performance improved when the experimental situation was changed so that less accurate localization of sound in space was required and less chance was allowed for a change from the initial direction of a response.

4. Several hypotheses are suggested as to the role of the auditory projection areas in the control of behavior involving localization of sound in space.

(Authors' Abstr.)

VOL. 13 J. NEUROSURG. NOVEMBER, 1956

Cephalic Bruits in Children. *Dodge, H. W., jr.*	527
The Diagnosis, Treatment and Prognosis of Tumors Affecting the Spinal Cord in Children. *Grant, F. C., and Austin, G. M.*	535
Communicating Hydrocephalus from Subarachnoid Bleeding. *Foltz, E. L., and Ward, A. A., jr.*	546
Safe Angiography. *Segelov, J. N.*	567
Infarctions Simulating Brain Tumours in the Posterior Fossa. *Lindgren, S. O.*	575
Epileptic Effects of Intracisternal Alumina Cream in Monkeys. *Chusid, J. G., et al.*	582
The Use of Phenolsulphonphthalein in the Clinical Evaluation of Hydrocephalus. *Bering, E. A., jr.*	587
Selective Partial Neurectomy in Hemifacial Spasm and the Electrophysiologic Selection of Patients. *Nosik, W. A., and Weil, A. A.*	596
Benign Tumors at the Foramen Magnum: Surgical Considerations. *Dodge, H. W., jr., et al.*	603
The Results of Surgical Treatment of Intracranial Aneurysms as Demonstrated by Progress Arteriography. *Mount, L. A., and Taveras, J. M.*	618
The Use of Sodium Diacetrizoate in Cerebral Angiography. *Dunn, J., jr., et al.*	627
Application of Monomolecular Filter Tubes in Bridging Gaps in Peripheral Nerves and for Prevention of Neuroma Formation. A Preliminary Report. *Campbell, J. B., et al.*	635

VOL. 14 JANUARY, 1957

The Use of Epidural Anesthesia for Excision of the Lumbar Disc. Report of 125 Cases. *Tice, W. P.*	1
The Role of Perineurial Sacral Cysts in the Sciatic and Sacrococcygeal Syndromes. A Review of the Literature and Report of 9 Cases. *Abbott, K. H., et al.*	5
*Acetylcholine and Serotonin in the Spinal Fluid. *Sachs, E., jr.*	22
Intradural Lipomas of the Spinal Cord. With Particular Emphasis on the "Intramedullary" Lipomas. *Caram, P. C., et al.*	28
Experimental Observations on the Prevention of Seizures by Intravenous Procaine Injections. *French, J. D., et al.*	43
Variations in the Spinothalamic Tract in Man. *Voris, H. C.*	55
The Thoracic Herniated Intervertebral Disc Syndrome. *Kite, W. C., jr., et al.*	61
A Note on the Treatment of Involuntary Movements of the Arm by Resection of the Brachial Plexus. *Bridge, C. J., and Horrax, G.*	68
Fatal Brain-Stem Shift Following Hemispherectomy. *Cabieses, F., et al.*	74

Acetylcholine and Serotonin in the Spinal Fluid

1. Spinal fluid acetylcholine and serotonin determinations have been done on a series of 140 patients suffering from head injuries and brain tumors and a variety of other neurologic disorders.

2. Both acetylcholine and serotonin, as well as another unidentified substance, have been found in a large percentage of these cases. Serotonin has not been reported previously in the spinal fluid of man.

3. Comparable studies on experimentally concussed animals have also been reported.

(Author's Abstr.)

VOL. 25 J. PERSONAL. SEPTEMBER, 1956

Effects of Anxiety, Stress and Task Variables on Reaction Time. *Farber, I. E., and Spence, K. W.*	1
Past Experience and Present Personality Disposition as Determinants of Selective Auditory Memory. *Davids, A.*	19
The Effects of Stuttering Behavior and Response Set on Recognition Thresholds. *Spielberger, C. D.*	33
Dynamic Systems, Perceptual Differentiation and Intelligence. *Livson, N., and Krech, D.*	46
Random versus Systematic Distribution of Information in Communication Nets. *Shaw, M. E.*	59

A Further Study of Infantile Handling and Adult Avoidance Learning. *Levine, S.*	70
The Judgment of Ambiguous Stimuli as an Index of Cognitive Functioning in Aging. *Korehin, S. J., and Basowitz, H.*	81
Self-Ratings and T.A.T. *Child, I. L., et al.*	96

VOL. 20 **J. PROJ. TECHN.** DECEMBER, 1956

Social Interest, an Adlerian Rationale for the Rorschach Human Movement Response. *Ansbacher, H. L.*	363
Prognostic Significance of the Under-productive Rorschach. *Bloom, B. L.*	366
TAT as a Measure of the Hunger Drive. *Epstein, S., and Smith, R.*	372
A Study of the Reliability in Human Figure Drawings. *Graham, S. R.*	385
A Study of Ego Identification by Means of an Index of Identification Derived from Six TAT Cards. *Groh, L. S.*	387
Two Dimensions of Test Structure in Rorschach-like Projective Tests. *McFarland, R. L.*	398
Motion Perception, Time Perspective and Creativity. *Miner, J. B.*	405
Rorschach Changes during Psychoanalysis. *Mintz, E., et al.*	414
The Projection of Hostility on the Rorschach and as a Result of Ego-threat. *Murstein, B. I.*	418
Insight Test Prognosis in Successful and Unsuccessful Rehabilitation of the Blind. *Sargent, H. D.*	429
The TAT Aggressive Content Scale. *Stone, H.*	445
Neurotic Depressives' and Alcoholics' Oral Rorschach Percepts. *Wiener, G.*	453

VOL. 44 **J. SOC. PSYCHOL.** NOVEMBER, 1956

Some Aspects of Personality Structuring in India (Hindu) Social Organization. *Asthana, H. S.*	153
Factor Analysis of Roles Patients Take in Therapy Groups. *Giedt, F. H.*	165
A "Culture and Personality" Study Based on a Comparison of Rorschach Performance. *Siegman, A. W.*	173
The Non-projective Aspects of the Rorschach Experiment. I. *Zubin, J.*	179
The Non-projective Aspects of the Rorschach Experiment. II. *Werner, H., and Wapner, S.*	193
The Non-projective Aspects of the Rorschach Experiment. III. *Haufmann, E.*	199
The Non-projective Aspects of the Rorschach Experiment. IV. *Gilson, J. J.*	203
The Non-projective Aspects of the Rorschach Experiment. V. *Singer, J. L.*	207
A Modified Interpretation of Thurstone's Flexibility of Closure Factor. *Keehn, J. D.*	215
Sociometric Status and Supervisory Evaluation of Institutionalized Mentally Deficient Children. *Clampitt, R. R., and Charles, D. C.*	223
Accuracy in Judging Emotional Expressions as Related to College Entrance Test Scores. *Weisgerber, C. A.*	233
The Role of Emotion in Prejudice. *Cooper, J. B., and Singer, D. N.*	241
Social Interactions of Rhesus Monkeys. I. *Miller, R. E., and Murphy, J. V.*	249
A Shortened "Basic English" Version (Form C) of the PF Questionnaire. *Cattell, R. B.*	257
College Environment, Personality and Social Ideology of Three Ethnic Groups. *Brown, D. R., and Bystryn, D.*	279

VOL. 6 **NEUROL.** DECEMBER, 1956

Large Intracranial Aneurysm Producing Panhypopituitarism and Frontal Lobe Syndrome. *Gallagher, P. G., et al.*	829
An Early Description of the Gerstmann Syndrome. *Benton, A. L., and Meyers, R.*	838
Quantitative Assessment of Motor Function in Cerebral Palsy. *Millichap, J. G., and Hadra, R.*	843
On Neurologic Terminology, Eponyms and the Lasègue Sign. *Wartenberg, R.*	853
Changes in the Glycoproteins of the Cerebrospinal Fluid in Neurologic Diseases. *Apostol, R. R., et al.*	859
Hearing and Speech in Infantile Hemiplegia Before and After Left Hemispherectomy. *Goldstein, R., et al.*	869
Familial Cerebello-olivary Degeneration with Late Development of Rigidity and Dementia. *Carter, H. R., and Sukarajana, C.*	876

VOL. 19 **PSYCHIAT.** NOVEMBER, 1956

Human Ego Functions in the Light of Animal Behavior. *Weigert, E.*	325
The Rating and Group Dynamics of the Psychiatric Staff Conference. *Whitman, R. M.*	333
Masculine Aspirations in Women. *Ovesey, L.*	341
Countertransference in the Psychotherapy of Marriage Partners. *Bird, H. W., and Martin, P. A.*	353
The Locus of Power in a Large Mental Hospital. *Cumming, E. and J.*	361
An Operational Conception of Psychotherapy. *Glad, D. A.*	371
Confabulation as a Social Process. *Weinstein, E. A., et al.*	383

VOL. 25 **PSYCHOANAL. QUART.** OCTOBER, 1956

River Symbolism. Part I. *Niederland, W. G.* 469
Clinical Manifestations of Ambivalence. *Brody, M. W.* 505
The Management of an Erotized Transference. *Rappaport, E. A.* 515
General Aspects and Implications of Introjection. *Bychowski, G.* 530
The Psychological Structure of Space with Some Remarks on Robinson Crusoe. *Berne, E.* 549
The Relationship Between Man and Dog. *Heiman, M.* 568

VOL. 18 **PSYCHOSOM. MED.** 1956

Social Class Prevalence and Distribution of Psychosomatic Condition in an Urban Population. *Rennie, T. A. C., and Srole, L.* 449
Some Influences of an Experimental Situation on the Psychotherapeutic Process. *Watson, P. D., and Kanter, S. S.* 457
Psychogenic Factors in Essential Hypertension. *Moses, L., et al.* 471
Psychological Factors Related to Results of Subtotal Gastrectomy. *Weiner, I.* .. 486
Psychoanalytic Psychotherapy in Raynaud's Disease. *Millet, J. A. P.* 492
Influence of Hindu Culture and Social Customs on Psychosomatic Disease in India. *Gupta, N. N.* 506

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Original Articles

EDUCATION IN PSYCHIATRY

THE PRESIDENTIAL ADDRESS DELIVERED AT THE ONE HUNDRED AND SIXTEENTH ANNUAL MEETING HELD AT LITTLEMORE HOSPITAL, OXFORD, 3 JULY, 1957

By

R. W. ARMSTRONG, M.A., M.D., D.P.M.

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EXTREMELY conscious of the honour of addressing you as your new President today, I feel rather like the character in "Ruddigore" who was required to perform his infamous misdeeds before the keenly critical eyes of his ancestors. I am acutely sensible of the psychic portraits, as it were, of my presidential ancestors lining the supra-temporal halls of our ancient association of psychiatrists and this induces in me a humble awareness of the contrast between my own shortcomings and the excellencies and achievements which we know were theirs. Some consolation is, however, afforded me for I trust that I will not be deemed presumptuous if I assume that two of my presidential ancestors are gazing down on me today with moderate approval. I refer to the two former Medical Superintendents of Littlemore Hospital who, like myself, have had the honour of presiding over our Association: Mr. William Ley in 1848 and Dr. T. S. Good in 1930. It is a matter of some justifiable local gratification that out of the four Medical Superintendents who have guided the destinies of Littlemore Hospital in its 111 years of existence, three have occupied the highest position in the Royal Medico-Psychological Association.

A General Secretary in the years which precede his translation to the highest office has unrivalled opportunities of learning from the presidents whom he serves and I can honestly say that I have learned from all of them. In that respect I am not alone, for a characteristic of our Association is that the many-sidedness of our particular discipline means that we all learn from one another—we educate each other. It is this theme of education in psychiatry that I have chosen today for my Address but I should not be content to restrict and confine such education within ourselves and our own speciality. On the contrary, I think it is our duty to educate the public about what we can do for our patients and, also of some importance, what we cannot do. Our immediate past-President, Dr. T. P. Rees, who only a few minutes ago led me to the place which he has filled with such distinction during the past year, nurtured in

Warlingham Park a number of psychiatrists whom he imbued with the principles of development and reform characteristic of him and sent them out to educate and improve more backward hospitals, but he did more: he never forgot the importance of educating the community which Warlingham Park served and the goodwill and esteem he built up for himself and his hospital were most happily signalled by the Borough of Croydon which made him a Freeman on his retirement. It has always seemed ironical to me that neither Warlingham Park, which has done so much to educate both psychiatrists and the public, nor my own hospital, at which medical students, health visitors and occupational therapists have been taught for many years, is called a "Teaching Hospital"!

I suppose that if one had to summarize our past-President's innovations at Warlingham Park, the best phrase to use would be that the characteristic of his viewpoint was a cultivation of the mental hospital community in its therapeutic orientation to the outside world. This is not done merely by unlocking ward doors and pulling down iron fences—recently some of our colleagues have indulged in a rather undignified scramble for credit in respect of these improvements to mental hospital amenities—but by making the chronic, long-stay patient feel that he is accepted and no longer unwanted in his illness by those around him and by giving the acutely ill patient a sense that he is a member of a segregated therapeutic group, moving at a slower pace than the outside world towards the point of establishing contact again as soon as possible with it. The hospital staff whose activities were once entirely intramural gained increasing acceptance in the Borough of Croydon and thus were able to establish valuable channels for the prevention and early treatment of mental illness. Surely Dr. Rees' chief claim (if he was not too modest to claim anything!) would be as a pioneer in psychiatric education?

I would now like to refer back to my previous observation that we in the Royal Medico-Psychological Association educate one another. In the early days our members used to meet at their various hospitals and inspect wards and farms and kitchens so that all might learn and profit from another's experience and ingenuity. Our Association has always had a significant proportion of members who are fired by the urge to achieve and disseminate knowledge. More recently we have been educating one another by the enormously successful Maudsley Bequest Lectures which have not only spread the gladsome light of psychiatry but have, by their excellence and good repute, very greatly increased our membership. These lectures were arranged as post-graduate teaching, primarily intended for the dissemination of accepted knowledge and not as a forum for publication of original work. Council thought that our younger members would be glad to attend such lectures and that we might expect 70–100 people to come. I need hardly tell you that what we conceived as part of our self-educating history has become, in the hands of Dr. William Sargant, a major psychiatric occasion in this country, that the Maudsley Bequest Lectures are over-subscribed and crowded-out and that the standard of excellence achieved by the lecturers has drawn not only our junior colleagues (for whom the course was designed) but senior psychiatrists of high professional standing who find time to listen to their peers and sometimes to their juniors delivering a teaching lecture.

I wonder if any other branch of our profession can boast a similar degree of humility and willingness to learn as the often criticized specialists of psychiatry. To the Maudsley Bequest lecturers and to our Registrar we owe a very great debt and I am delighted to take this opportunity of paying tribute to them. It would be indeed unfortunate if the success of our self-educating arrangements obscured the possibilities of more individual enterprises. Our Association is willing and anxious to award every year a gold Gaskell Medal, a bronze medal and two money prizes (£10 and £5). Here are dangled the rewards for initiative in our branch of medicine—the marks of distinction in a young psychiatrist. Always there are periods in the history of a corporate body when one facet of its development halts while others progress and for some reason the Gaskell Prize was not sought by those of adequate merit last year. Let me take this opportunity of drawing the attention of the vigorous of intellect and the enterprising of thought to these awards, the possession of which will surely lead to advancement in our speciality.

So much then in broad outline for the activities, individual and collective, of our Association in the education of its members. You may feel with me that this is all very capital but when we turn to our achievements in educating the public I am less happy. Most of my senior colleagues will share my feeling that all our conscientious efforts over a period of years to inform the public about our work and our psychiatric hospitals have been somewhat unrewarding. If we make painful progress with a series of carefully prepared television programmes it is only to slip further back into ignorance and prejudice as a couple of patients from Rampton make the headlines of the daily newspapers with their foolish exploits.

An immense amount of harm and hindrance to early treatment of mental illness is due to the confusion existing in the minds of 99 per cent. of the population between mental deficiency and mental sickness. No amount of correction seems to be of any avail with the newspapers or with the public on this point but for twenty years I have emphasized the truth of the matter to my students and perhaps in another twenty years my successor will be able to report better things. In actual fact many of us have been able to educate our own local communities to a limited extent by inviting the public to visit and view our hospitals. This has done much to dispel ignorance in many matters but here I would make the point that it is not enough to proclaim an Open Day at the Mental Hospital, the public must be wooed and enticed with entertainment and buns or they will stay away for the rather interesting reason that we have nothing very sensational in the line of padded cells or Snake Pits to show them. Nor do I consider that mental health exhibitions, consisting usually of the better examples of occupational therapy work, some pictures of asylums ancient and modern and a few of our neater nurses gathered round an E.C.T. box, do very much to educate the public about our work. A better notion is surely the wise use of a cine camera to record the activities of patients and staff and show something of a mental hospital at work. I suggest that the dynamic approach to public education in psychiatric matters is by making such a film and by showing it round the Women's Institutes and British Legions of the area served by a hospital. If this suggestion be considered feasible, it follows that we must set our houses in order . . . Often the years have blunted our vision in matters of buildings, overcrowding and patients' clothing, but we cannot rely on the public turning a blind eye on our deficiencies and it is absolutely vital that we should upgrade our hospitals to a point where we are willing to have them on display to all who are genuinely concerned. This will require money and we will only get money by awaking the public conscience to the relatively backward state of our physical resources. Much is being done to help us by the various Leagues of Friends of our hospitals and I discern a very gradual spread of information among the general public of our needs, but a realization of the responsibility of our Association in the field has recently prompted Council to propose a Standing Sub-Committee for the purpose of Public Relations. It will be the duty of the members of this committee to voice the considered views of our Association on medico-psychological matters arising in day-to-day social affairs when either responsible bodies or the Press seek our views or when it seems desirable for such views to be made known in the interests of Society. If we have lagged behind the need for such a mechanism of information it is because we have never held professional advancement among our aims and so have tended, by virtue of this and by virtue of our natural distaste for propaganda, to neglect the setting up of an organ of public relations. Obviously the time has now come to remedy our omission.

Turning now to the education of our own junior colleagues in our specialized field I should like to refer to a development which has been sponsored by our Association in recent months. This is a practical application in the teaching of psychotherapy whereby experienced practitioners of psychotherapy of all schools and no school are being invited to make available their knowledge and experience for those who wish to learn other than physical methods of treatment. Our hope is that by a system of apprenticeship and supervision of case-management our junior colleagues who may not wish to undertake subscription to the views and submission to the training of a particular school of psychodynamic thought, may yet learn some of the skills, principles and techniques of short-term psychotherapy which will enable them to meet the needs of an out-patient session or a group of psycho-neurotic in-patients. In this way, utilizing to the full our national genius for compromise, we shall avoid the ugly schisms between analysts and shockers that weaken the reputation of psychiatry in some less-fortunate countries.

This enlightened project for the teaching of psychotherapy to young psychiatrists is but part of the general problem of their education and I should like to refer with pleasure to the recent development within our Association of the use of audio-visual aids to teaching, sponsored by Dr. Jonathan Gould. This work may have far-reaching implications for we have learned that when many sources of attention are mobilized, retention of information is more efficient. In other words the use of sound films may be increasingly a desirable method of teaching candidates for the D.P.M. It is all the more important, therefore, to remember not to overlook the primary role of apprenticeship in psychiatric education nor fall into the error of imagining that anything can replace the living experience for the young psychiatrist of day-to-day contact with his patients and with his seniors in formal and informal discussion, for it is not too much to say that only by such personal contacts can one acquire the essential knowledge of our discipline which is not susceptible to rigid formulation in principles of theory or rules.

The hard work involved in reading text books and literature, the attendance at formal lectures and the demonstrations of cases are necessary, or at any rate unavoidable for the post-graduate studying to qualify in psychiatry and it may be objected that, in view of these provisions, there is no need for the additional aspect of training that I have called apprenticeship. Furthermore, many senior psychiatrists may feel that teaching is not their *métier* and that they have little time to teach their juniors. I would insist in the face of all such arguments that some form of craftsman-apprentice teaching and training will always be essential in the making of a sound psychiatrist with, as many of my general practitioner friends say, "both feet on the ground". Looking back in my own case and making the unwarranted assumption that I qualify as a sound psychiatrist, I would select and pay tribute to three Masters from whom I learned greatly—Douglas McRae who taught me to know my patients and how to manage them, G. W. B. James whose clinical assistant I was at St. Mary's and who taught me the work of a psychiatrist in an out-patient clinic, and Thomas Good, at whose feet I sat for a year when I came to Oxford as a willing apprentice in order to learn something about psychotherapy. My short point is that no part of this knowledge could have been gained from book or from lecture.

For those of us who have the stimulating task of teaching medical students it is important to decide where one stands in the scale of opinion expressed within the two extremes—"psychiatry is the other half of Medicine, and Medicine is the other half of psychiatry". Most undergraduate teachers feel very strongly at times that their speciality plays too small a part in the medical curriculum and I personally have long grumbled at the totally inadequate amount of pre-clinical instruction insisted on at my own University. The Oxford tradition that an undergraduate may please himself as to whether he does or does not attend lectures is ill applied to the training of medical students and over the last 18 years I have repeatedly found that perhaps two-thirds of my pre-clinical pupils have paid me the compliment of accepting all I had to offer in the way of teaching, while one-third were too busy rowing or running to be able to come to my classes at all. By simple calculation I estimate that roughly 350 Oxford medical graduates have in my time dispensed with any lectures and demonstrations on the psycho-neuroses, to say nothing of the psycho-somatic concept. What these graduates have learned in our subject they have learned from general physicians and from text books. This is an admittedly unsatisfactory state of affairs when considered in the context of general practice with an expectation of at least 30 per cent. of minor mental illness and perhaps accounts for the high rate of referrals to psychiatric out-patient clinics by some general practitioners. On the other hand, the very real interest in psychological medicine shown by some of my pupils is already bearing fruit within my own consultative field for I number among my general practitioner friends several old students of mine who are cheerfully and willingly devoting time and enthusiasm to that minor psychiatry which can be done so well in general practice. After due consideration I have come to believe that pre-clinical instruction in psychiatry should be compulsory and should be the subject of a professional examination as are anatomy and physiology. Professor Pickering has said that each professor feels it his duty to his subject to demand sufficient hours be allocated to it in the curriculum and that his subject has a separate examination—all perfectly valid except for the forgotten fact that the student's capacity for intellectual punishment is extremely limited. This is so true, and so self-evident, but I think we teachers of undergraduates have hitherto been over-diffident in our demands for a larger share in the medical curriculum. In America teaching of psychiatry is based upon the recognition "that psychiatry has progressed beyond interest in the abnormal human only and is now interested also in the average man and how he relates to his total environment". I quote Dr. John Ewing of the University of North Carolina who describes the steps taken to integrate psychiatry with general medicine at that University's Medical School in a recent article. From this it is only too clear that we have far to go in this country before we approach American standards of teaching in our subject. Even if we decide that we do not necessarily want to go so far or so fast, we could still advance a long way without attaining grounds for complacency. In the United States the average teaching time in our speciality is 152 hours, according to statistics supplied to the first World Conference on Medical Education—I wonder how many of our British medical students receive even half that amount of teaching in this country! Little will be accomplished until time and experience has modified the attitude of our teaching colleagues to many of whom psychiatry cannot be regarded as a scientific discipline because it lacks an organic pathology. Eventually the integration of psychiatry with medicine will surely be best accomplished in case conferences where psychiatrists play their part in discussion with other clinicians. MacCalman has wisely said that "it is only when the student comes to know the psychiatrist as a familiar figure in the wards, out-patient departments and clinical conferences that he recognizes and accepts the part which psychological medicine has to play in the prevention and treatment of ill health".

It is necessary for me to allude briefly to the places where psychiatry is taught to medical students. Most of the teaching, apart from formal lectures, is done in out-patient clinics and in mental hospitals. Valuable as these may be, the student is handicapped because he usually sees a patient only once and acquires only a uni-dimensional view of the case. The opportunities for direct contact between student and patient are far too meagre in most medical schools and even when there is a psychiatric unit as part of the teaching hospital, it is not usual for students to be given the chance or the time for clerking there. Nevertheless, it is in these general hospital psychiatric units and in the wards of general hospitals that medical students should, in my opinion, be taught psychological medicine and they should be taught by psychiatrists who should set and mark examination questions in the students' Finals. The Birmingham experiment where students had to take and pass a separate examination in psychiatry as part of Finals perhaps went too far but at least it was preferable to the Oxford system where general physicians set and mark questions in psychiatry.

It is important that students should visit a mental hospital to learn something of its aims, therapeutic atmosphere and legal implications. Now that most mental hospitals are designated as Observation Wards, they often have a wealth of clinical material on which the student can be taught, but I can see little advantage in showing medical students advanced and chronic psychotics: such patients are more usefully studied by graduates working for the D.P.M., and where there are psychiatric units for early cases, there the student can most profitably study psychological medicine.

It is worth considering for a moment who should actually do the undergraduate teaching, for very considerable developments have been taking place in this field during the last twenty years. In the London teaching hospitals students are and have been taught by part-time Consultants on the staff of these hospitals. In the provinces the students formerly received their instruction in psychiatry from a Medical Superintendent in a mental hospital but in recent years Professorial appointments at provincial universities have had the effect of reducing the part played by both Medical Superintendent and his mental hospital. Only in Oxford and Cambridge is there no Chair of Psychiatry and Cambridge does not teach clinical medicine anyway. I have no doubt that the teaching of psychiatry to students has benefited by the establishment of Professorial Units and that in time my own "home of lost causes" will come into line with other universities. When this happens I shall hand over the major part of my teaching duties with very great reluctance, for there is no activity which keeps a medical man on his professional toes more firmly than the duty of instructing the young! Perhaps I might record a plea that psychiatrists who carry out the thankless and unrewarded duties of medical administration in addition to their clinical responsibilities should be allowed to contribute to undergraduate teaching—I think we have, without undue conceit, a good deal to contribute which will be a use to the future general practitioner in his management and disposal of a mentally ill patient. I am aware that the present swing of the pendulum has produced a climate of opinion which favours the selection for all academic teaching posts in psychiatry of those who are uncontaminated in any way by experience in administration. May I gently make the point that the past somewhat excessive exaltation of Medical Superintendents is no more and no less misguided than the present tendency to imagine that all knowledge and virtue must automatically belong to Consultants in psychiatry who have chosen the purely clinical or laboratory path to advancement?

Lastly I turn to the education of our nurses. Our Association has long concerned itself with the education of mental nurses and it would be idle for me to recapitulate the pioneer work done by our predecessors in the examinations which we have only recently handed over to the G.N.C. For many of our members this relinquishment of our examination in mental nursing was a misguided move and one to be deplored or regretted. I personally firmly believe that our leaders behaved wisely in coming into line with other branches of nursing and, reluctant as I am to say it, it has become apparent to me that we have advanced further in the education of our nursing staff in the last five years than we did in the whole of my previous twenty-five years' experience. I could wish that our staff recruitment and our supply of future senior nurses matched the advances in our training methods. It is a sad reflection on the present position in the Oxford Region that the cost of bringing a student nurse through to staff-nurse's position worked out last year at £3,000 a head, allowing for wastage. Once again the thought of educating the general public comes to my mind. We who work in and around psychiatric hospitals know so well the value and importance of good nurses and how hard it is to recruit and keep them. But our hospitals have not that social cachet which produces waiting lists of young women drawn from the cream of upper middle-class society. Could we but educate the general public about the interest and importance of our work we might even attain the position (here I speak for my own hospital) of taking on the nursing staff one or two *British* young women from our own neighbourhood, for you must understand that in Oxfordshire (as in many other counties) mental hospital patients do not have the advantage of being nursed by young women born and brought up in the county. However, we are very glad to have on our nursing staff young people from other parts of the country and of the world and these are the ways by which nowadays we try to educate them. Firstly, what I have already said about the value of the apprenticeship system applies as much to nurses as to young psychiatrists in training. This means that nurses must be taught on the wards by the medical staff and by the Sisters. In order to correlate teaching methods the Oxford Regional Board has done pioneer work in running Refresher Courses for Sisters and Charge Nurses. These courses last a week and are run every quarter with the object of instructing senior staff not only in the latest developments in psychiatry but in inter-personal relations and man-management. As our student nurses are being taught the latest methods in the Training School, we have considered the necessity to keep our senior nurses up to date in the same methods in order to avoid conflict on the Wards. We meet this by sending our seniors in turn as observers to the student nurses' classes and tutorials so that the Sister or Charge Nurse knows exactly what is being taught to the student nurses who will be posted to their wards. We also meet the need for co-ordination by monthly

Nursing Procedure Committee meetings which are attended by all senior nursing staff, assistant matrons and tutors. The Matron acts as secretary and the Medical Superintendent invariably presides. These meetings have proved most valuable and we use them in a wide variety of ways for instruction and dissemination of information and as a forum for discussion which produces opinions, recommendations and—not infrequently—criticisms. Recently I have had the pleasant experience of giving a course of systematic lectures in Psychology and Psychiatry to the senior student nurses at this hospital and have been gratified by the voluntary attendance at these lectures of senior members of the nursing staff and, indeed, by others who are interested but who are not engaged in nursing. May I draw your attention to the analogy with the Maudsley Bequest Lectures to which, as I mentioned earlier, go not only our junior colleagues studying for the D.P.M. but their seniors who attend out of interest and to keep abreast of what is being taught. It is so obviously desirable in the wards of our hospital that the student nurses should not be better-informed than their seniors for, as we have so often found, such a state of affairs breeds jealousies and resentments and makes for bad inter-personal relations.

When I look back on my earlier days when candidates for our Association's examination received so many lectures from the medical officers and some coaching from an assistant matron I reiterate with some confidence my opinion that we have come a long way in the education of our nursing colleagues. The facts that our standard of recruitment is disappointing and our wastage-rate is alarming do not invalidate my contention that we have raised the level of nurse-training.

Here at Littlemore we have been fortunate in our teaching association with the Dorset House School of Occupation Therapy and students from that school have had regular lectures and demonstrations from my medical colleagues. The influx of such keen and often intellectually bright young people into an elderly mental hospital is inevitably a stimulating experience for their teachers and, as I have said about medical students, keeps the teacher on his psychiatric toes!

Furthermore, for a considerable number of years we have had the pleasant duty of helping in the education of Health Visitors who come to me for lectures and demonstrations in early mental illness and in mental deficiency. I regard this part of our educational work as of the very greatest importance, for every one of these trained nurses will go into countless homes and households where not only will they be able to give useful advice about the referral of patients to their family doctors where the need of psychiatric treatment seems evident, thus enabling the family doctor to treat or seek consultant help in treatment, but the Health Visitor who has been taught in and has seen the work of a modern mental hospital can do so much to overcome the prejudices and help to educate the general public in matters of mental health.

Ladies and gentlemen, in speaking to my title I have ranged over a wide field and omitted more than I have included—this of necessity. I have tried to touch on some outstanding points—points of achievement, points of development, points of recession and, alas, points of neglect. It is well for us to take stock from time to time in this field, for education in psychiatry—whether it be of the general public, our medical colleagues, or our student nurses—is a subject which merits, I suggest, your recurrent and earnest attention.

AIM AND METHOD IN TREATMENT: TWENTY YEARS OF BRITISH AND AMERICAN PSYCHIATRY*

By

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THIS Address tonight will mostly concern psychiatric treatment, and it must be quite exceptional, I think, for those of us, still in our late forties, to have lived through such a revolution in treatment as we have seen in the last twenty years in this country. In this revolution I believe we have seen Great Britain emerge as one of the countries now leading the world in the skilled, humane and all-round treatment of her mentally ill patients. There is obviously still very much that needs to be done, yet we must try not to underestimate what has already been achieved recently in this country.

By tradition, the President of this Section is allowed to be reminiscent, and I would like to take advantage of this privilege in my Address so as to be able to look back with you on some of the varied psychiatric treatment happenings of the past twenty years. I think there is much to be learned from them of help to us in the future. Unfortunately, none of us can really hope to get any idea from our past experience, of the kind of *detailed* psychiatric treatments that we may be called upon to practise in the next twenty years. For if the past two decades should have taught us anything at all, it is that we shall never know what exactly is suddenly coming round the corner as a new and important treatment development in our speciality.

I have been very fortunate indeed in all the opportunities that have been given me for exploring the various possible treatment approaches in psychiatry. Starting psychiatric work in a mental hospital with great historical traditions, I had later the chance to train and work under the late Professor Edward Mapother (of whom you will hear so much in this address) at the Maudsley Hospital and to spend nearly fourteen years on the staff of that hospital. I was able to spend all the war years in studying the fascinating special military and civilian treatment problems of those exciting days, working as a member of the staff of the Maudsley Hospital, then evacuated to Sutton Emergency Hospital. For the last eight years it has also been possible to explore the even more varied opportunities for psychiatric treatment and research that occur in the set-up of a London general undergraduate teaching hospital, where a psychiatric in-patient treatment unit and special out-patient treatment department have both been provided, and where such easy and ready access to and contacts with the rest of general medicine and surgery are available.

In this address I shall also want to discuss some special aspects of American psychiatry, so as to compare and contrast them with ours. For there are also important lessons to be learned about our future aims and methods from such comparisons. I must stress here that it is only after four separate visits over eighteen years, including two whole years of psychiatric work in the U.S.A. at Harvard and Duke Medical Schools in 1938 and 1947, that I have dared for the first time to talk about this matter.

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* The Presidential Address (abbreviated) given before the Section of Psychiatry of the Royal Society of Medicine on Tuesday, 9 October, 1956.

I was particularly fortunate to have entered psychiatry from general medicine in 1934, when for the next year or so treatment was to be still almost virtually non-existent, as we know it today, for the ordinary run of patients either inside or outside a British mental hospital. Admittedly, Freud, Adler and Jung's specialized psychotherapeutic methods had already been in use in Great Britain for a long time. As early as the first World War one of my predecessors at St. Thomas's—W. H. B. Stoddart—was starting to teach British medical students a new psychiatry based on Freudian dynamics (1). Freud, Jung, and Adler certainly created renewed interest in the detailed working of the mind of man, and also helped to raise to new heights the dignity of and the respect for the sufferer from a mental illness. They also rightly insisted on the need for a most detailed study of the individual patient for treatment purposes, and this has proved just as important for the proper use of the newer physical methods as for the psychological treatments. But unfortunately when I entered psychiatry in 1934 the position was, in general, almost exactly the same as it is today in regard to this group of specialized psychotherapeutic methods. They were proving able to help only comparatively few of the mentally ill in a really concrete and practical manner, and these few could involve so much work, and take up so much of a doctor's time, that the problem of providing for the practical treatment of the mentally ill in hospitals in Great Britain had hardly been touched by their introduction at all.

I entered psychiatry as a locum at Hanwell (now St. Bernard's) Hospital where a hundred years previously Conolly's work had helped to abolish physical restraint in British mental hospitals. Like our modern psychodynamic theorists, Conolly had not only preached the gospel of the importance of love and affection for the mentally ill patients, but he had practised it to some very real purpose. In "moral treatment" he got nearly as far, and possibly even farther than many have reached again today, who are stressing a predominantly psychotherapeutic and social approach. But it is most important to realize that it was obviously very far from being enough. Conolly knew it himself only too well, and was always looking round for new bodily treatments and new physical ways of helping patients (2).

Hanwell in my time still remained a happy hospital with a much beloved superintendent, who was known to and admired by all his patients as a true friend and counsellor. Dr. Daniel seemed to have a real genius for understanding mentally ill patients and establishing good personal relationships with them. But he, too, had learned, and we all learned at that hospital very soon, as Conolly had also learned a hundred years before, that a psychotherapeutic and social approach was not enough in itself to get so many of our patients well. I shall never forget some of the wards then, with their agitated and perpetually suicidal patients, who seemed almost impossible to get at, let alone help by any means then available to us. These patients should always be remembered by those, especially of a younger generation, who wonder how much progress has actually been achieved by using the all-round empirical treatment approach of present-day British psychiatry, which allows every available method to be used regardless of theory or belief—provided only that it helps and does good rather than harm to the patient. In most British mental hospitals, where all modern methods—such as leucotomy, insulin, electric convulsion therapy, group psychotherapy, the new chemical tranquillizers, occupation therapy, unlocked wards, the admission of voluntary patients and the like—are now available to be used and combined when necessary, these old disturbed wards and these patients have largely disappeared. Furthermore, this broad empirical approach to treatment has now also made possible the opening of so many more of the doors of the old locked wards, often because there are now so many fewer distressed and violent patients in them to try to run away, and this in turn reduces frustration, tension and abnormal behaviour still further in the rest of the mental hospital population not well enough to be discharged.

A little later the late Professor Mapother offered me a locum at the Maudsley and I accepted with renewed hope. He was trying to gather together a team of varied workers, collected from general medicine, who might be interested in research into all the possible physical and psychological approaches to psychiatric treatment that he felt might suddenly develop at any time. His pet obsession, which later also became mine, was that the really workable and practical psychiatric treatments would eventually turn out to be physiological ones, as in the general medicine of today. Insulin, E.C.T. and leucotomy were unknown, and few guessed how many of the hormones and vitamins influencing mental behaviour would so soon be synthesized, or that such a range of modern chemical tranquillizers would be produced so quickly. Mapother was at that time being roundly abused or laughed at by very vocal ideological rivals. Firing their psychological broadsides, these rivals accused Mapother of trying to search for a cause of the neuroses with an ophthalmoscope. How right Mapother was to continue to try to do so at a somewhat discouraging time for him and for us all.

The history of recent psychiatric treatments and the present British aims and methods in psychiatry cannot be understood without knowing more of this truly remarkable man. For the people who were trained by him at the Maudsley now occupy so many of the important posts in British psychiatry and also abroad, that British psychiatry at least has now largely become Mapother's dream come true. His genius lay in a rare capacity, obvious to all, for collecting and keeping around him strong personalities of the most diverse talents and quite differing viewpoints, and so he hoped to build up a permanent staff of clinicians who would eventually make the Maudsley the "Queen Square" of psychiatry. The rapid dispersal of so many of them to other centres after World War II was certainly not among any of his long-term plans. But it has helped to give British psychiatry its present wide, varied and broad basis of treatment.

Mapother felt, after seeing the results of Freudian and other specialized forms of psychotherapy for many years, that these alone held out very little hope of ever solving our enormous treatment commitments in a really practical manner. But he certainly never denied the great importance of psychotherapy as a part of all forms of treatment. He utterly refused to accept as inevitable so much of the suffering of the mentally ill at that time. Mapother expected us to work and continue to work intensively with our individual patients, using all of the few treatment methods we then had at our disposal. He deplored nihilistic attitudes to treatment even then. But effective methods in those days were almost non-existent and somehow we had to hide from ourselves, I think, and from others our real treatment impotence even to shorten the length of an attack of acute recoverable mental illness in most instances.

If I am stressing treatment conditions and results prevailing in those days, it is to counterbalance some recent viewpoints heard both in this country and in America, that if only one could spend more time on psychotherapy, the need would largely disappear for modern physical treatment methods. Some psychotherapists are now even going so far as to call these merely the newer forms of physical restraint (3). Yet in America today, especially in centres where they are trying to stress psychodynamic and psychotherapeutic approaches to treatment at the expense of the more empirical physical treatment methods, they are openly advocating that two hours a day of personal guidance and help should be given to the young psychiatrist in training to help to tide him over his despair at the lack of any immediate concrete results of his treatment efforts. Certainly we too needed that sort of consolation and support at Hanwell and the Maudsley. But there is certainly no need for it now in British hospitals and psychiatric clinics when all types of new and of older proven methods are being properly and selectively used.

In trying to understand the many problems that the advent of these new physical treatments suddenly created at that time, it is important, I think, to realize that, apart from a few persons like Mapother, psychiatry then seemed relatively unprepared to deal with them in a sensible and practical manner. Many psychiatrists, then as now, were much more philosophers than general doctors in their outlook. They were in obvious rebellion against the materialistic and mechanistic viewpoints of modern medicine, and some wished for a return in our speciality of a better appreciation of philosophical and spiritual attitudes. There were others, too, who wished to emphasize the importance of the non-material mind in psychiatry. But all these more philosophical aspects of mental illness might start to seem very unimportant from a treatment point of view when even a very severe religious melancholia, for instance, cleared miraculously after only a few crude epileptic fits induced by cardiazol, and with so little psychotherapy perhaps being necessary at all.

Only a few persons like Mapother, in fact, seemed to suspect what was coming. When asked what were the qualities needed for a good psychiatrist, he insisted that he really did not know. For they might have to change so rapidly at any moment. Mapother always insisted on having on the staff of the Maudsley, for instance, only those who had obtained the M.R.C.P. For he felt that at any rate he then had a team of potentially good physicians. How right he was in this, looking back on what has happened since in our speciality. A lot of our troubles in the last twenty years have been that too many would-be philosophers have been forced, suddenly and often against their will, to try to use in a skilled manner what are medically and surgically very powerful and potentially very lethal treatment weapons. Because we have not always been the good physicians that Mapother would have had us be first and foremost, we have often also taken up much too violent emotional and philosophical attitudes about them. Such attitudes are very much rarer in general medicine simply because the actual results of treatment are considered much more important than any philosophical theory or belief behind them.

In 1938, just after insulin and cardiazol had been tried and were found to be working so well in selected patients in Great Britain, I was advised and helped by Professor Mapother to go to the U.S.A. on a Rockefeller Fellowship. This was the first of four subsequent visits and two years of work in that great and fascinating country. About that time I think one saw the start of some of the present wide divergencies of emphasis in treatment in British and American psychiatry, still to be seen at the present time. We must accept it now that we are sometimes a very long way apart in some of our general treatment aims and in the uses we make of all the various treatments now available to us in our speciality. We should try to understand why. Before World War II, Adolf Meyer was well on his way to unifying most aspects of psychiatric thought and practice in both countries. It was also standard procedure for the British as well as the Americans to try to go and sit at the feet of that great man in Johns Hopkins University at Baltimore. At that time, too, the Rockefeller Foundation was starting to pour money into psychiatry, but were looking for a change of approach, which could be more actively therapeutic even if less broadly based than the Meyerian one. The Rockefeller Foundation had also realized, as had Mapother, that to help to mould medical opinion towards psychiatry and create a more favourable atmosphere to its future development, it was the undergraduate medical schools that often mattered far more than the post-graduate ones. New Chairs of psychiatry were therefore being encouraged and supported by the Foundation in the leading undergraduate medical schools in the U.S.A. To help to stimulate such new approaches, physicians or physiologists of acknowledged eminence were sometimes appointed who were particularly interested in the psychoanalytic or "psychodynamic" approach.

During a year spent at Harvard at the Massachusetts General Hospital in 1938–39, at one of the very best of these new Rockefeller endowed units, I was able to watch and discuss the results of treatment with Freudian psychoanalysis, or the briefer forms of psychotherapy largely based on its principles. But I noticed that all the newer physical treatments were being ignored, and it was still the same when I returned there on another visit in 1947. And still the same yet again even in 1954. This meant that many hundreds of Harvard medical students would have meanwhile been taught a restricted viewpoint on treatment; and it was to become just the same in so many other undergraduate medical schools all over the U.S.A. This has now gone on for over fifteen years. Thus psychoanalysis has become the treatment of choice in most academic psychiatric circles. British psychiatry has too often made the mistake of thinking that it is broadly based postgraduate centres and mental hospitals which dictate its future psychiatric policy; but what often matters much more are the undergraduate teaching hospitals. Great Britain could start to go Freudian, or Jungian, or Pavlovian overnight if all the undergraduate teachers got together and decided this was the approach that should be taught to all of the hundreds of medical students each year. This revolution could be effected, probably, quite regardless of what postgraduate psychiatric centres and mental hospitals were thinking at the same time. For mental hospitals and postgraduate clinics have generally in the end to play the tune demanded of them and bow to the views of the rest of the indoctrinated medical profession.

At any rate, I returned from the U.S.A. in 1939, at the outbreak of war, having been given a real opportunity for a year of seeing psychoanalysis and "psychodynamic" psychiatry at its very best in an excellent general teaching hospital atmosphere, and being used under an honest, critical and most inspiring leader. But it became more and more obvious during that year that even by the widespread use of such methods, one could never hope to start to touch even a minute fringe of the large numbers of moderate and severe neuroses and psychoses crying out for urgent help and treatment in both our countries. Other better and more practical methods simply had to be found as speedily as possible. Over the year, too, I had seen many patients doing no better at all than with the more simple and direct psychotherapeutic and physical methods we were using at the Maudsley. Furthermore, only so very few patients could be handled with these more doctrinaire types of psychotherapy. This meant that most of the psychiatric patients either had to be put on an indefinite psychotherapy waiting list, or be turned away with absolutely no treatment at all. My year, however, was certainly not wasted. Mapother's views on treatment, which had roused so much criticism even in Britain, now seemed to have been amply confirmed.

Mapother, unfortunately, did not live to see the final triumphs of his foresight and planning in England. He died soon after the war started, thinking that its outbreak meant the probable end of all his work, instead of the beginning of a new era in which his views would be so triumphantly vindicated, and his work so effectively carried on in British psychiatry by all those he had inspired.

Present trends in psychiatry in Britain cannot be understood without realizing what happened during World War II. For so many of our preconceived theories about the causation and treatment of neuroses fell to pieces under a very searching test, and in a Britain geared for results in a total war. It was not possible any more to deceive oneself as easily as in peacetime. Also, all that mattered was that as many patients as possible should be got better to serve in the total war effort, and therefore new attitudes to treatment were more quickly able to gain a strong foothold in Great Britain and they have not been dislodged since. Electric convulsion, insulin treatment and leucotomy, front-line sedation and the group therapies became so rapidly and widely used in this country simply because it was found then that they all worked so well in properly selected patients (4).

One of the outstanding developments of the war years, which passed relatively unnoticed then, will undoubtedly prove to be the development of various forms of group therapy. At the beginning of the war, many psychotherapists had entered on it with very high hopes of showing what could be done by the more individual psychotherapeutic approaches. But the first group of really acute Dunkirk neuroses shattered the hopes of many of the pure psychotherapists. Only by using combinations of all treatments, such as "front-line" sedation, continuous sleep, barbiturate abreaction and modified insulin together with psychotherapy, was it often possible to work apparent wonders and at least to avoid much of the terrible chronicity seen during and after World War I. And even with all these additional physiological and environmental aids to psychotherapy, the available psychotherapists also found they could not even start to tackle, let alone help, a tenth of the urgent individual treatment demands being made upon them.

Nothing I say about the value of physiological aids to psychiatric treatment must be allowed to minimize the importance of additional and practical psychotherapeutic approaches. I am only concerned in this address to try to get all such treatment approaches into much better practical perspective. And as religion and politics have shown for so long that psychotherapy can often best be given in groups, it did seem sensible that hard-pressed psychiatrists should at last try to do the same thing, particularly when it was new beliefs, interpretations and better attitudes which we wished to get home to our patients. Furthermore, the formation of groups in British mental hospitals in peacetime has given to such patients a new status and dignity they did not have before.

The end of the war certainly showed a Britain now much more ready to accept all forms of empirical treatment—group therapy had even started to be combined with leucotomy, insulin coma with individual and group psychotherapy. People of different viewpoints, who had worked together during the War, now more happily continued to do so during peacetime, because we had all found something of selective value in the methods being used by the others.

Mental hospitals, too, began to be staffed by persons of all viewpoints. The present era of intensive if empirical psychiatric treatment in Great Britain was, in fact, beginning to dawn.

Shortly after the end of the war, a neutral surviving dictator state sent one of its psychiatrists to report on Britain's new psychiatric approach. He bitterly complained to me that he could not find any typically British approach. Everywhere he went, he said, he was being told something quite different by people of obvious psychiatric authority. I reminded him that we had just fought a long war so as to be allowed as individuals to think and act differently from our colleagues if we so pleased. And this independent treatment attitude has happily grown stronger and stronger in psychiatry in Great Britain ever since. Great Britain seems to be exceptional, in fact, in the very great freedom of psychiatric thought and practice to be seen here at the present time.

I have been privileged to make three further visits to the U.S.A. since the war, and in one of these I spent another very happy year of work there. Adolf Meyer's empire had suddenly crumbled with his retirement during World War II, and so few traces of it remained even by 1948 that it might almost never have existed. A great vacuum was suddenly created, for Meyer had left no real successor to his throne. Into this vacuum entered the strong and growing body of dynamically orientated Freudian psychiatrists, now having very strong general medical and research backing. Certainly by 1948 nobody had much hope of obtaining an important professorial teaching appointment in the U.S.A. north of the Mason-Dixon Line, unless he had finished a personal psychoanalysis and had accepted what is called a "psychodynamic" approach to treatment. And it is still very much the same today. This has naturally had some very serious repercussions on the treatment of the mentally ill in the U.S.A.

For we sometimes tend to forget that no personal or training psychoanalysis is ever really finished till at least the basic tenets of the Freudian psychoanalytic theory have been accepted. In any intellectually honest person, aims and methods of treatment must then of necessity undergo very profound changes. Certainly little encouragement is generally given to the use of the newer physical treatments by persons so trained, since these treatments so often seem to violate important basic tenets both as to the theoretical causation of a mental illness and its proper treatment.

Such viewpoints must not be thought of merely as American ones, for we also see in our own country, for instance, Dr. Winnicott, the present Chairman of the Institute of Psychoanalysis in Great Britain, demanding the right of all mental patients to be allowed to suffer to the point of suicide rather than that their psyches should ever be "violated" by our modern physical methods of treatment (5). The following "psychodynamic" viewpoint, on the proper training of psychiatrists, also reflects some present American attitudes, but actually appeared recently in a letter written by a British doctor (6) to the *British Medical Journal:*

> The practice of good clinical psychiatry is primarily dependent on the ability to develop "empathy" with patients, which can only be done by those whose personalities are sufficiently flexible to accept the insights of analytic psychiatry, whether Freudian, Jungian, Sullivan, etc. Disappointed physicians and neurologists usually possess a resistance to such concepts which could only be overcome by a training analysis . . . Physical methods of treatment, including the latest batch of tranquillizers, are quite secondary in importance to an analytic approach. They are useful, but only as a means of facilitating empathy and psychotherapy in its widest sense. Seven years in psychiatry, including two years in North America, only confirm my opinion that, however valuable an organic approach may be it is no substitute for an approach based on an integration of the great analytic schools and learning theory, whether one's work is in the so-called back wards or in acute neurosis units.

Whether or not this somewhat limited viewpoint can ever really be considered a justifiable one, we must not forget some of the effects it often has on our aims and methods of treatment in the handling of the ordinary psychiatric patient. It does in practice put many patients straight back again to the unhappy treatment conditions prevailing in British mental hospitals twenty years ago when I entered psychiatry and when, as discussed earlier, psychotherapy and sedation were our only available treatments. In America the demands for psychoanalytic treatment now greatly exceed the supply of available practitioners because of the teaching of this approach in so many of its medical schools. Incomes of twenty to thirty thousand dollars a year may now be earned by most psychoanalysts prepared to do this type of treatment in private practice. But this has also meant that the American mental hospitals, where the bulk of the mentally ill are treated, as in Great Britain, have now lost practically every one of their finest clinicians, because they cannot pay anything like the salaries now to be earned from the private practice of psychoanalysis and psychotherapy. And this has happened, unfortunately, just at the time when this whole range of new treatments, both physical and psychological, have emerged which demand that persons of the very highest standards of medical training, and even the higher standards of clinical judgment, should remain working in mental hospitals so as to choose, combine and give all such treatments selectively and skilfully.

The treatment differences now seen in the mental hospitals of both countries can sometimes be very marked indeed at the present time. For instance, let us look at some of the claims being made for the value of the new chemical tranquillizers in some American mental hospitals. Nothing approaching the same results are being obtained in Great Britain partly because all other empirical methods have been and are being so much more widely used, and therefore there are so many fewer chronically agitated and acutely disturbed patients still left to treat now. Hoffman and Konchegul, testing out one of the new chemical tranquillizers as a possible aid to treatment in such mental hospitals, report in a recent paper from St. Elizabeth's Hospital, Washington, that as few as 39 of its noisy and violent patients needed 17,839 hours of seclusion in a period of only seven weeks during the time that nearly half of them were being treated with Serpasil, and this was despite the fact that the half on Serpasil had had their seclusion reduced by over 40 per cent. by a reduction of their extreme agitation (7).* In England today, however, only 6,000 hours of seclusion (and very much less in some of the most active treatment hospitals) may be needed for a whole hospital of two to three thousand mental patients of all types over an entire year. Increased seclusion of patients can be due to many causes but if in Great Britain, for ideological or any other reasons, we had left so many of our agitated and disturbed patients untreated by such empirical methods as insulin, E.C.T. and various types of leucotomy, to concentrate more on psychodynamic approaches, we could never even have started to unlock so many of the doors of our acute and chronic mental hospital wards throughout the country; and this in turn has proved to be most helpful in the proper psychological handling of many other types of patient not needing these particular physical treatments. We have also certainly not found, as is being claimed in the U.S.A., that the new chemical tranquillizers can in any way replace full or even modified leucotomies in so many of our patients, though they can be very helpful indeed in a carefully selected few.

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* In the first six months of 1955, when this article by Hoffmann and Konchegul was published, E.C.T. was reported as used in only 12 out of 7,500 patients in this hospital (8). On a personal visit there in 1954, I also learned that insulin coma and leucotomy had been almost entirely given up, but that psychodynamic treatment viewpoints were strongly held by many of its staff. The hospital is excellently administered and is one of the foremost American psychiatric hospitals.

In Russia, where Pavlov rather than Freud now dominates treatment viewpoints, leucotomy has been totally banned for some years, largely because it was thought to conflict with Pavlovian theoretical concepts. Yet in Great Britain we still go on getting a third of our chronically mentally ill patients out of hospital wherever this method is used; and other patients, remaining in hospital after it, may be relieved of intolerable mental suffering and become able to be transferred from locked disturbed wards to open ones on full parole. Nearly 15,000 full and modified operations have now been performed in Great Britain simply because it does seem to help so many of our otherwise mentally tortured and chronic patients in so practical a manner.

From the patient's point of view, at least, it seems that our present broad empirical approach in Great Britain, tied to no particular ideology or dogma, does certainly improve his chances of being helped both inside and outside of the mental hospital, and to increase greatly his expectation of being able to leave a mental hospital much earlier.

Several obvious facts stand out on looking back over the past twenty years. The most important of these is how few of us, either in England or the U.S.A., guessed from which direction the next really important practical treatment discoveries in psychiatry were going to come. All our future treatment aims and methods in Great Britain must certainly be directed to seeing that no selective approach or dogma is ever propounded or taught again in psychiatry that prevents the rapid use of all new treatment methods. And we should also try to see all new advances as additions rather than as replacements of still valuable older methods.

However much we happen to disagree personally with any particular approach or treatment method, we must in future always allow it the opportunity to show its worth, for the last twenty years have shown how wrong even the experts have generally been in their judgments before new treatments have been properly tried out. It is Britain's great good fortune at the present time that it happens to have no predominant psychiatric approach and so few dominant psychiatric personalities. We are also, I am certain, now providing the essential opportunity and the practical testing ground so necessary for an eventual reconciliation and re-synthesis of so many of the differing dogmas in our speciality to be seen in so many other countries today.

Before the introduction of the N.H.S., for instance, the ultimate goal of promotion in the mental hospitals of Great Britain sometimes involved virtually giving up most of one's clinical work for administrative duties. Now clinical consultants are appointed in mental hospitals at the same rates of pay as the physician-superintendent and a doctor can specialize in the skilled treatment of patients without being penalized for not becoming an administrator as in most other countries. Furthermore, the same special "merit" awards are awarded to the clinicians working in mental hospitals as in other specialties. This enables the really first-class clinicians to remain in mental hospital work instead of being withdrawn by the lure of increased salaries to the psychiatric departments of general hospitals, or into the private practice of psychiatry. Appointment Boards, with the independent assessors provided by the Universities and Royal Colleges, and the compulsory national advertising of all senior posts in mental hospitals, has helped to stop too many persons of one type of thought staffing a particular hospital, unless there are very special reasons for it. The N.H.S., too, has enabled certain centres like the Tavistock Clinic and the Cassel Hospital, specializing in psychoanalysis, or a centre for special group treatments at Belmont Hospital, to have exactly the same status and financial support as all the other more general psychiatric units and hospitals. All London undergraduate teaching hospitals have now been given strong and quite independent psychiatric departments, and most now have beds of their own, making them much more independent of the mental hospitals and postgraduate centres. New Professors of Psychiatry have been created in most of the provincial medical schools. All this spells ever greater clinical freedom for new ideas to develop, and a greater chance to see them carried out all over the country.

When I was last visiting the U.S.A., in 1954, I was trying to describe the present happy state of British clinical psychiatry under the N.H.S., even if its research aspects still leave so much to be desired. I described it as a pleasant and loosely organized system, which worked so well simply because it had no primary direction or aim except one, and that was the patients' own practical treatment welfare. I learned afterwards that some of the audience felt that such a state of affairs in British psychiatry, even if true, simply could not continue, and that one psychiatric ideology or the other, as in other countries, must inevitably win and dominate all the others. If I have a suitable plea on which to end this Address, it is that we in Britain should go on playing our special type of "all-in" psychiatric game, quite determined that no one side shall ever really win it. The game must also never stop, so that we can always go on learning how to improve our technique of play for our patients' benefit. In all our aims and methods, the patient rather than the belief or the method must continue to come first. We must remain tolerant of all those aims and methods helping even a very small selected group of patients, and perhaps only shortening a particular attack of an illness rather than curing the illness itself. We must also be prepared for all our own personal pet aims and methods to be replaced gradually, or at least to be supplemented by much better ones, as time goes on and our psychiatric knowledge grows. And, above all, let us try to preserve a true sense of psychiatric humility.

Now, as doctors, we do often have to make very important and difficult personal decisions on the choice of particular treatments for our patients, and sometimes have to take calculated risks with their lives, and with their remaining mental health, so as to try and save them from a prolonged and agonized chronicity. Here there is one rule that will help to preserve our humanity, and also keep our determination to do everything possible to help such patients. That rule is that we do nothing, or omit nothing, that we would wish to be done to ourselves or to one of our own family, if we ever happened to be placed in the same unhappy circumstances. Then I think we cannot go very far wrong, either, in any of our own *personal* aims and methods of treatment.

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THE INTELLECTUAL AND SOCIAL STATUS OF CHILDREN OF MENTAL DEFECTIVES

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PART I

INTRODUCTION

THE purpose of this survey was to assess the intellectual and social status of 150 children of 73 certified mental defectives. It is proposed to discuss the mothers in this paper and the children in a further one. The mothers in this group were all at one time patients at the Fountain Hospital. Much of the initial work was done by Mrs. L. Mundy, the Senior Psychologist, who had already tested most of the mothers, and Miss Kerry, the social worker, who had maintained contact with many of the discharged mothers and their children. One of the main factors which have made the research easier has been the general good feeling towards the Fountain felt by our ex-patients. They want the Fountain in general and the Physician Superintendent in particular to know how they are and what they are doing. Dr. Hilliard's "somewhat unorthodox procedure with difficult cases" (1956) and his views on feeblemindedness have now become fairly generally accepted. His view that many of these women can work successfully in the community has been substantiated already. It is hoped that this survey will help to avoid the inhuman and expensive administration process whereby an allegedly feebleminded mother is permanently separated from her child.

HISTORY

Feeblemindedness was first considered as a major problem at the beginning of this century. This was due to a variety of causes. Those administering education realized that there was a group between the normal and the ineducable. In 1899 provision was made for these children in special schools. Educationalists themselves changed their attitude and became more hopeful that something could be done for these children. Their confidence had been slightly tempered, but they still hoped that planned education would make certain grades of defectives socially efficient. On the other hand, Francis Galton (1869) writing on "Hereditary Genius" had drawn an obvious parallel with defectives. Fear of defectives on eugenic grounds arose from these views. This was coupled with a political fear that with universal suffrage the "degenerate members", who were all too prolific, would control the country and decide who was to govern. The dangers of giving this group of people full citizen rights was emphasized even more in America than in England. Binet in 1902 encouraged people's scientific interest in defectives by producing an intelligence test. This was first used for discerning subnormal children, and provided the means by which defect could be measured.

In this way Intelligence tests, Educational Acts and theory, political awareness, genetic discoveries and eugenic fears, as well as social conscience all led to the "discovery" of the feebleminded.

At first the concept of feeblemindedness was rather loose and it is interesting to note the rather dogmatic statements made by responsible people around this time.

Davenport (1911) in *Heredity in Relation to Eugenics* and using Goddard's genealogies writes: "Low mentality is due to the absence of some factor, and if this factor that determines normal development is lacking in both parents, it will be lacking in all their offspring. Two mentally defective parents will produce only mentally defective offspring."

Downing (1931), also quoting from Goddard's results says: "feeblemindedness apparently behaves as a Mendelian recessive . . . If a feebleminded individual comes from parents, both of whom are congenitally feebleminded, or who have a great deal of feeblemindedness in their ancestry, such a one is taken to be a pure recessive as far as his character is concerned, and his germ-cells have a double dose of the factor for feeblemindedness (FF). When two such persons mate their offspring would be expected to be all feebleminded . . . Out of 144 such matings resulting in 482 offspring whose records are known, Goddard found that 476 were feebleminded." He goes on to describe "matings" of normal-feebleminded (NF) and (FF) giving half normal and half feebleminded offsprings and of two NF types who give children in the ratio of three normals to one feebleminded.

Fernald (1912) writes: "Feebleminded women are almost invariably immoral and, if at large, usually give birth to children who are as defective as themselves."

In a pamphlet by Neff *et al.* (1915) entitled "The Degenerate Children of Feebleminded Women" is found the following: "Practically all poor, feebleminded women at large become mothers of illegitimate children soon after reaching the age of puberty . . . The histories of these feebleminded women and their feebleminded children are all practically the same. Their unfortunate birth, helplessness, pauperism and ruin is part of a continuous series whereby the community is constantly supplied with the elements of degeneracy."

A. E. Tredgold (1929) writes, after pointing out that unfit members in society now survive: "The result is a state of disharmony between society and its degenerate members, in which the unfit multiply, and threaten the race with economic and biological disaster."

Berry and Gordon (1931) in *The Mental Defective* write: "The mental defective is often responsible for the making of the slum, and swells the ranks of the drunkards, vagrants, criminals and prostitutes—all more or less charges on the community."

These views led to a fairly widespread movement in favour of sterilization. In England the departmental committee on sterilization presented its report in 1933. Various studies had previously been carried out purporting to show that defectives had larger families than normal, even though they had an increased death rate. Sayer during 1904–1906 found 7·6 children born in defective families as opposed to 5·1 in a normal family. The death rate brought the defective families down to 4·7 while the normal families had 3·9 survivors. Jones (1934) in a Merseyside survey, found in defective families there were 7·16 children of whom 4·7 survived, while normal working class families had 3·92 children, 1·97 of whom survived. In neither survey were intelligence tests used and the concept of "defectiveness" is rather vague. A. F. Tredgold (1952) quotes similar figures for America. The move for sterilization was always more popular in America than in Britain where it has rarely been carried out although there has been some support for it.

In due course there was a swing away from the armchair view that nearly all defectives would have nearly all defective children, toward interest in actual results. Those interested in genetics were some of the first to gather family histories. None of these surveys used intelligence tests for the parents and children, but made estimations or relied on relatives' accounts. In several surveys mental defect, alcoholism, mental illness and delinquency were not seen as separate entities. This method of approach was again more popular in America where the most famous family histories investigated between 1877 and 1912 were the Juke family, the Kallikak family, the Hill Folk and the Nam family. Davies and Williams (1930) in their book on *Social Control of the Mentally Deficient*, mention 4 other family histories of defective stock.

Penrose and Turner (1934) described a family history of a defective brother and sister who had had two children who were not defective. This was obviously something of an oddity. Numerous criticisms have been made of the larger studies, but at the time their effect was widespread.

Apart from the family history method, the question as to how great a part was played by inheritance in producing a defective was approached in two ways. Method 1: Surveys were made of the parents of defectives and special school children. The main drawback to this method was that, although the parents were visited, they were not tested. Where the parents were poor, or where there was no home, the children were more likely to be in State institutions. This may have affected the results. Burt (1955) in his book *The Subnormal Mind* points out the fallacies of this method. He writes: "Still more conclusive is a study of the offspring of parents known to be defective. In investigations into heredity the usual procedure is to start from the child and work backwards. It would seem far more logical to start from the parent and work forwards." This then is Method 2. Surveys were made by tracing the children of certified adults or ex-special school children. Lewis (1934) used this method in his sterilization report and states his reasons for doing so in paragraph 24. Until Penrose's study there was, almost always, a lack of definition of what was meant by a mental defective. The seriousness of the defect in both parent and child was not investigated. Mental deficiency was seen as a single syndrome and not as a continuum with normal mental ability. With both methods there was a tendency for the work to be carried out by champions of either the hereditary or the environmental school. A brief tabulated survey of the research with these methods is given in Tables I and II.

It is not proposed to discuss each of these researches in detail. Many are not strictly comparable, but a tendency can be seen for the percentage of defectives found to decrease. Summaries of the results of the two main studies are given.

Lewis (1937) writes: "Whether the cause be bad heredity or adverse environmental conditions, or both, the children of parents, one or both of whom are mentally defective, are, on the average, below normal, and our enquiry shows that nearly one-third of such children as survive are likely to be defective, and more than two-fifths must be expected to exhibit some degree of mental abnormality."

Penrose (1938) writes: "The incidence of defect amongst parents and siblings of patients was estimated to be as high as from 7–9 per cent. (the incidence amongst patients' own children being much higher) and this exceeds by some 6–8 per cent. the figures for the population in general." He found no

TABLE I

Method I. Surveys of the Parents of Defective and Special School Children

Name	Country	Date	No. of Cases	Group	Percentage of Children With Defective Parents (One or Both, not Specified)	Percentage of Children With One Parent Defective	Percentage of Children With Both Parents Defective
Sayer	England	1913	100	Defectives	34		
Reiter and Osthoff	Germany	1921	250	Special School Children	—	56	11·6
Dayton	U.S.A	1921–23	2,729	Special School Children	15·4	—	—
Morrells	U.S.A.	1924	45	Defectives	73·3	—	—
Mental Deficiency Committee of Surrey County Council	England	1926	500	Defectives	25*	—	0·8
Lokay	Germany	1929	82	Defectives	<12†	—	—
Myerson	U.S.A.	1930	566	Defectives	29·3	—	—
Brugger	Germany	1930	254	Defectives	23	—	—
Myerson and Elkind	U.S.A.	1930	1,889	Defectives	—	10*	6
Williams	England	1930	100	Special School Children	5	—	—
Berry	England	1933	165	Defectives	60*	—	—
Wildenskov	Denmark	1934	200	Defectives	62	—	—
Herd	England	1934	—	Special School Children	15	—	—
Burt	England	1913–35	—	Special Schools	6	—	—
Penrose	England	1938	1,280	Defectives	7·6	—	—

* Parents defective or insane.

† Lokay's results are given in the form: "12 per cent. of the parents were defective"

TABLE II

Method II. Surveys of the Children of Defectives

Name	Country	Date	No. of Parents	No. of Children	Percentage of Children Defective	Intelligence Test Used
Burt	England	1913	Nearly 500	—	14	Yes
Brugger	Germany	1930	—	—	41	No
Vanuxem	America	1931	—	229	69	No
Woodall	America	1932	—	119	44	No
Lewis Sterilization Report	England	1934	—	3,650	16·9 (23·5 retarded)	No
Penrose	England	1938	67	124 56 tested	30·3	Partly
Stippich	America	1940	—	48	21	Yes
Skeels and Hanns	America	1948	—	87	<5·5	Yes

unequivocal evidence of sex-linked genes (inheritance factors) in the causation of mental defect. On the other hand, there was definite evidence in favour of Mendelian recessivity and dominance respectively in some of the rarer conditions he found among these patients. He concludes that the aetiology of mental defect is multiple and may be caused by gene mutation.

In his survey Penrose quotes no correlation figures between the parents and their children but says that "the grade of child appeared to be almost independent of the grade of the mother". He found just over 30 per cent. of the children of mental defectives to be themselves defective.

Tredgold (1952), summarizing some of the above researches, writes that "Mental defect is present to a varying extent in the parents of defectives (in England in about 10 per cent. of cases); but it occurs to a much greater extent in the children of defectives (in England about 50 per cent.). In general, I think it may be said that these figures point to a progressive family increase in the severity of the mental abnormality and in the number of persons affected."

Burt's studies stand out as claiming much smaller percentages than his contemporaries. This may be due to the fact that he is dealing with a rather brighter population (special school children) rather than all grades of patients in an institution, but it is also likely to be due to his greater experience and objectivity and to the fact that he used intelligence tests and actual interviews with the children in his survey. The figures in this research appear to agree more closely with his than with many of the others.

Finally, Penrose can again be quoted as saying in 1952: "Personally I do not believe that there is any truth in the idea that deterioration of the population will occur if high-grade defectives are allowed to breed naturally. However, judged from the point of view of the child, the conditions of health and nutrition depend upon the mother a great deal and I think that each case must be judged upon its merits as a medical rather than an eugenic problem." Many of these surveys do not define clearly whether they are using legal, social, intellectual or statistical criteria to denote mental deficiency. By "defective" it is not always clear if they mean those who are actually certified, or those who are socially incapable, or those who are below a certain level of intelligence.

THE MOTHERS

(*a*) DESCRIPTION OF GROUP

Number. Of all the mental defectives who have been admitted to the Fountain Hospital, 73 are known to have had children. Four of the mothers were short-term "Place of Safety" cases, but different in no other way from the main group and have therefore been included. The mothers were all South Side Home patients admitted round about the age of 22.

Age and length of stay. The average age of the mothers in December, 1956 was 40·8. The average age at certification was 22 years (73 cases) and the average age at discharge was 36 years (65 cases). Those discharged had been certified for an average of 14 years.

(*b*) INTELLIGENCE OF MOTHERS

In 3 cases out of the 73 no intelligence tests were given. These were old cases and were transferred or discharged before the appointment of a psychologist to the hospital. Of the remaining group, 54 had Full Wechsler-Bellevue tests, 10 had Verbal Scale Wechsler tests, 59 had Terman-Merrill 1937 Revision of the Stanford-Binet Form L tests, and 51 had Progressive Matrices tests.

All the tests were given by Clinical Psychologists, most of the above were given by Mrs. L. Mundy, Senior Psychologist at the Fountain Hospital. When the mothers' test scores are averaged the 70 have a mean I.Q. of 73·5. The results with the Terman-Merrill and Wechsler-Bellevue tests were found to be very different. Considering just the Terman-Merrill results, the mothers have an average I.Q. of 61·1 with a range from 38–84. This then appears to be a fairly representative sample of high-grade feebleminded mothers. However, if one considers the Wechsler-Bellevue I.Q. they are considerably higher. Forty-four of the 73 mothers have been given the Full-Scale Wechsler and their average I.Q. is 83·1 with a range of 49–113. The 51 Progressive Matrices scores give an average I.Q. equivalent of 81·1 which agrees closely with the Wechsler average. A group of 40 mothers have had both the Terman-Merrill and Wechsler-Bellevue tests. In all but 12 cases they were given within 2 or 3 days; with these 12 cases the order and length of time between tests did not appear to affect the scores consistently in any direction. These 40 mothers had an average Terman-Merrill I.Q. of 63. and an average Wechsler-Bellevue I.Q. of 83. The correlation between the two tests is ·72. On all the Wechsler tests the average verbal I.Q.=80·7, and the average Performance I.Q.=88·8. These results are very similar to those found by Charles (1953). However, he compared 1916 Binet Scores with the later Wechsler I.Q.s. He found the Wechsler Verbal I.Q. approximately 14 points higher, the performance I.Q. more than 30 points higher and the full scale I.Q. about 23 points higher. The whole question of the relative scores on the two tests is being investigated by Mrs. L. Mundy. These cases are a selected sample (because they have had a child) of her larger group of feebleminded women. A number of studies have been done on the correlation between Wechsler-Bellevue Scale and the Terman-Merrill, but most investigations do not use this feebleminded to dull normal group. Ainsworth, Wagner and Strauss (1945) found a higher performance than verbal score in a group of similar girls. Earl (1940) noted a higher performance score among those more suitable for licence and Rapaport (1946) quotes a large number of studies on these two tests. The Terman-Merrill is basically a children's test and although the Wechsler appears to give rather high scores at times, the success rate of the mothers as described later seems to indicate that it has a higher predictive value. This view is held by Whitcomb (1945), who writes: "The Wechsler-Bellevue Scale, although it is not so widely used as a basis for classification in institutions for adult defectives as the Binet, does seem to be the more accurate measuring instrument."

One of the obvious differences in the two tests is that the Wechsler allows for deterioration while the Terman-Merrill does not. The average age of the mothers when they were given the Terman-Merrill test was 34 so that 3 per cent. or less than 3 points might be accounted for by this. The difference in standard deviations of the Wechsler and the Binet is another factor which might help to account for the 20 points. The standard deviation of the Terman-Merrill is not constant for age and is not given for those over 18 years (Terman and Merrill, 1947). It has been taken as 16·5 and the Wechsler standard deviation as 15 (Wechsler, 1944). When the average scores of the two tests are converted to an SD of 16 points, the Terman-Merrill average of 62·5 becomes 63·2 and the Wechsler average of 82·5 becomes 80·8 for 40 cases.

Another fact which needs to be taken into account is that while the Terman-Merrill is a mainly verbal test the Wechsler is made up of verbal and performance items. The women in this study are performance-biased as shown by their average Wechsler performance score being 8 points higher than their verbal score. A possible explanation is that a girl who for hereditary or environmental reasons does badly at school may be better on the performance side. If just after leaving school she becomes a nuisance, she would be far more likely to be certified than a verbally biased girl. Later her performance ability might well lead her to make a good work adjustment and to be an obvious case for discharge. Whether this difference is due to the verbal items being more sensitive to environmental hazards is a moot point.

All these differences at the most would account for about 9 points. The variation in range should also be noted. With these women the Terman-Merrill range is 46 points whilst the Wechsler range is 64 points.

The mothers as a group appear to have been living below their capacity. Mundy (1954), Clarke and Clarke (1954) have shown considerable rises in the I.Q. with girls of this sort, both on coming into an institution from a bad home background and on going from the institution to a post outside. An assessment of the home background of these girls was therefore made.

(*c*) FAMILIES FROM WHICH MOTHERS CAME

In looking through the mothers' files it was noticed how many came from overcrowded homes, or had just lost a parent or were physically handicapped in some way. To try and assess these factors, four headings were made: Physical, Emotional, Educational and Economic handicaps. It is of course difficult to assess the extent of these after thirty or more years, but the sub-headings were made as objective as possible. The groups are not in any way exclusive, but extremely interdependent. The death of the father in a family almost certainly meant that they were economically worse off. These secondary effects of the main factors are not included in the following assessment.

Physical Handicaps

Defective sight	11
Defective hearing	9
History of epilepsy	6
Defective speech	5
Endocrine disturbance	4
Poor general health	3
Alleged congenital syphilis	3

All these factors might lead to an underestimate of their intelligence at the original interview when they were certified and most would be a handicap in education. Thirty-six mothers suffered from one or more physical handicap.

Emotional Handicaps

To differentiate between the mothers who were certified patients and their own mothers, the latter have been referred to as grandmother, thus:

Grandmother
Mother—(patient at the Fountain)
Child
Grandchild (of patient)

Emotional Handicaps

Mother illegitimate	9
Grandmother died or left home before mother aged 5 ..	7
Grandmother died or left home when mother aged 6–10	3
Grandmother died or left home when mother aged 11–21	8
Grandfather died or left home before mother aged 21 ..	21
Total mothers included in above	43
Grandmother described as emotionally maladjusted ..	20
Mother separated from home for more than 4 years before 16	10
Mother described as emotionally unstable	19*
Mother described as psychotic	5*
Total mothers included in above	67

It is very difficult to assess whether the mothers were emotionally upset because of events before certification or whether this was their reaction to certification and being put in an institution. Out of these 24 cases (described as emotionally unstable and psychotic), 16 were either illegitimate, had lost a parent or had a maladjusted grandmother, 3 more had physical handicaps.

Sixty-seven mothers came under this heading of emotional handicap, nearly 92 per cent. The disturbance in their home life was fairly certainly one of the main factors that brought these women under the Mental Deficiency Act.

Educational Handicaps

These are rather difficult to evaluate because the social and medical histories merely mention the school and length of stay. Many of the cases are old and it is now impossible to say whether any misplacement as to length of stay in elementary or special schools occurred. The attitude of the teachers and the size of the class could have made a considerable difference. The large number of physical handicaps have to be taken into account as well as the emotional factors, both are in a sense educational handicaps. Those belonging to education *per se* were:

Educational Handicaps

Missed school for long periods (due to illness, playing truant or helping at home)	8
Over 5 changes of school	5
Less than 5 years schooling	3
Foreign language difficulty	1
Total mothers included in above	14

Economic Handicaps

Again this is difficult to evaluate as the economic status of this group has altered considerably during the last 50 years.

Economic Handicaps

Father generally out of work and family very poor	7
Public assistance given almost continuously	4
Total mothers included in above	11

In 15 cases the family circumstances were not stated fully enough or there was no home to assess. In a total of 11 cases the economic handicap was very severe, but in many more cases the family were managing on very little.

A large family does not always mean economic hardship and was more usual at the beginning of the century, but these families appear to have been even larger than average. By Penrose's definition (1950) this group are certainly biologically fit: 50 of the mothers are from families of 5 and over and 21 of these come from families of 10 and over. In every case but one the mother had another handicap beside being one of a large family.

The number of siblings was not known in 3 of the cases. The remainder had 527 siblings or an average of 7·3 each. In 48 cases where the death rate of the siblings was known, it was 108 or 26·8 per cent. This death rate is similar to that found by Penrose in the siblings of certified patients which was 27 per cent. Penrose (1938) writes: "the number of children born to feeble-minded persons has been investigated by different observers with diverse results, though most workers have found a correlation between size of family and parental intellectual inferiority. It appears from my own figures, that the highest fertility is associated with a parental intelligence which is on the borderline of mental defect as it is generally understood; as the mental grade of parent diminished below this point, fertility also diminishes." Elsewhere (1950) when discussing the whole problem of differential birth rate with respect to mental ability he says "that there is a maximal fertility at some point between I.Q. 50 and I.Q. 80". The matter is discussed further in the 1946 Galton Lecture "The Trend of National Intelligence".

Eighteen of the mothers had at least one sibling who had been under the Mental Deficiency Act. The I.Q. of these mothers and their children will be discussed later.

As a whole, 36 Mothers had one or more Physical handicap
67 Mothers had an Emotional handicap
11 Mothers had an Economic handicap
14 Mothers had an Educational handicap.

Two mothers had none of the above handicaps, one of these came from a large family only and the other came under none of the above headings. It would not be surprising if coming from these conditions some of the mothers tested well below their "true" level and appeared to those dealing with them to be of even lower intelligence than their test score would indicate. In 23 cases an early I.Q. was recorded, the present Terman-Merrill I.Q. was 66·4 whilst the early Terman-Merrill was 54·1, an average difference of 12·3. Several of these women were then described as imbeciles. The early tests often appear to have been inadequately done, they were not carried out by a psychologist and were re-quoted in some cases for more than five years. It seems possible that over the years a maturing process has been taking place. It is also possible that this would have been accelerated by one or at the most two years' intensive training and mothering instead of certification for 10 years or more. Many of these girls would have been very suitable for residential probation rather than certification. In a group of 30 consecutive admissions to a probation home tested recently, over a third had I.Q.s below 90 and in this group gains of over an average of 6 points were noted on re-testing. Residential probation is mainly used for court cases when the home conditions are unsatisfactory and it seems that some of the cases who, in the past, would have been certified following minor crimes, should now be given a year's comprehensive training without certification.

(*d*) REASON FOR CERTIFICATION

The reasons given for certification varied and the social notes and the certification notes do not always agree. In 44 cases out of 73 the patient's pregnancy appears to have been the main cause of certification. The sections which were used are given below in Table III. The court cases ranged from "found wandering" at 6 years and another "stealing goods amounting to 1/1d." to stealing £3 as the most serious. The time at which the children were born in relation to the mothers' certification is given in Table III.

TABLE III

Reasons for Certification

Section	Explanation	Number
Section 6	Usually used when in social difficulty or when the parents' consent is "unreasonably withheld"	53
Section 8 and 9	From a court or place of detention	14
Section 7	Transferred from guardianship	2
Section 15	"Place of Safety" when found neglected, etc., and pending presentation of Section 6	4

Children born before mother's certification as M.D.	=42	86
Children whose conception caused mother to be certified	=44	
Children conceived while mother detained under order	=4	22
Children conceived while mother on licence	=18	
Children conceived after mother's discharge from M.D. Act	=10	42
Children conceived after mother's discharge and marriage	=32	
	150	

Three mothers were married before they were certified.

(*e*) PRESENT STATUS OF MOTHERS

Sixty-five or 89 per cent. of the 73 mothers have been discharged. The remaining 8 are as follows:

Still at South Side (a hostel for adults) (1 being on daily licence*)	4
Transferred (1 being on licence*)	3
On licence*	1

The 65 discharged mothers are employed as follows:

Working	27*
Married	26*
Not traced, but working when last heard of	4*

Eight are not now working:

At home (2 of these attend occupation centre)	3*
In mental hospitals	2
In Old People's Homes	2*
Dead (having worked competently after her discharge)	1*

* Thus 66 of the 73 mothers (90 per cent.) have now worked and lived in the community.

Those who are married or employed have been discharged for an average of nearly 5 years ranging from one month to fourteen years. Many of them keep in touch with the Fountain Hospital, contacting the Superintendent or the Social Worker if they want advice or help with filling in forms, and similar problems. The married mothers have a lower average age, but similar intelligence to the unmarried, reflecting the alteration in policy of allowing suitable cases to marry. Taking only the mothers of live children: out of the 28 who are 41 years and over, 7 are married and 21 are unmarried, whereas of the 32 who are 40 and under, 19 are married and 13 are unmarried. The number who have had live children has hardly altered, 28 are over 41 and 32 are 40 and under, but the number married has risen from a quarter to over a half.

(*f*) MOTHERS AS WIVES, HOUSEWIVES AND MOTHERS

Two very divergent views have been held on the discharged defective's abilities to run a home and bring up children.

1. "Defectives make inefficient parents; if only for social reasons they should not have children." (Lewis, 1934.)
2. "From results one concludes that with the exception of those with I.Q.s between 30–49 the degree of the mother's retardation has no relationship to the adequacy of child care." (Michelson, 1947.)

It was decided to rate each mother separately under the three headings above. The scale was made as objective as possible, but it is realized that this is a way of describing the data rather than a score of any kind. In an effort to check the results, the social worker who has been visiting some of these families, was asked to make independent ratings. A five-point scale was used, a score of 1 meaning she was very poor and a score of 5 very good. A score of 3 indicating an average for the neighbourhood and general social background. The actual criteria used are given in Appendix I.

TABLE IV

Ratings of Mothers as Wives, Housewives and Mothers

Score	20 Mothers	22 Wives	21 Housewives	Total
1	0	2	2	4
2	4	2	3	9
3	7	8	9	24
4	8	7	6	21
5	1	3	1	5
Average score ..	3·3	3·3	3·1	3·2

Discussion

Twenty-three discharged defectives, when they were rated as Mothers, Wives and Housewives, were found to be on average a little better than those of the surrounding district. The social worker made 25 independent ratings as a check. She made three ratings lower than the psychologists, i.e. considering the discharged patient was managing worse than had been thought, but the remaining ratings were the same or higher. In no case were they more than a point apart. She has had considerable experience of working in these localities and considerable reliance can be placed on her assessment of the "average".

Mothers. In twenty cases the mother is now looking after her own children. This group contains most of the recent cases. In the past it was seldom attempted. On the rating scale, the average for these mothers when rated for child care is 3·3, which is considered as normal mothering ability. However, this is not a situation in which one can be content with averages. No mother had a score of 1, but 5 had a score of 2. These are cases where it is necessary that some help should be given. The mothers have almost certainly never been given any advice on how to deal with children of over two years. Their own unsatisfactory upbringing is bound to have been a drawback. Michelson (1947) in the study referred to earlier found a tendency for child care to become less adequate as the number of pregnancies increased or the number of children in the home increased.

Wives. Twenty-two women were rated on the general success of their marriage. The average score was 3·3. Two women were separated from their husbands and 3 were unhappy, but together. Seven seemed average for their social group, 7 seemed rather happier than average and 3 seemed extremely contented. On the whole these girls are at a grave disadvantage when marrying; they have a past which probably has effects similar to those of a prison sentence or a long stay in a mental hospital. It is very difficult to attach blame to an unhappy marriage, but it was felt that in 2 of the 5 more unsatisfactory marriages, it was largely the husband's fault that the marriage was not a happy one. The discharged defective is not always a liability to a man, several of the women were working as well as running a house, in 2 cases the wife was keeping the husband while he was ill, by domestic work.

Housewives. The ratings for this ability had a very similar distribution to that of the women as wives, but individually there was considerable difference. The average rating for this group was 3·1, slightly lower than that of the other groups. One would expect this to be the highest average, as, if a girl gets any sort of training in an institution, it is usually in housework, not in child care or human relationships.

In considering the various ratings together the mothers can be divided into two groups, those whom the social worker or the writer considered were below average for one or more of the abilities mentioned, i.e. one or both of us gave them a score of 1 or 2, and those who had no such score. The average I.Q. of the 11 mothers with low scores was 81·5. The average I.Q. of the 15 mothers with no low scores was 81·9. It appears for this group of mothers, intelligence is not the main factor affecting their abilities as housewives, mothers and wives.

(*g*) EFFECTS OF INSTITUTIONALIZATION

The 73 mothers have an average of 14 years as certified patients. The majority of them are now considered able to manage their lives for themselves. The effects of such long periods under supervision do not appear to have been investigated. This is considered to be a suitable subject for research, but no systematic work was done on the problem in this survey. It was noted, however, that some of those with housing difficulties were relying solely on the housing authorities and felt "someone ought to do something about it". This dependence on authority may well be typical of the larger normal social background from which these girls come, rather than a product of certification. It was also noticed that some of the girls had married men much older than themselves. This is a similar finding to an American study (Ainsworth *et al.*, 1945) where it was found that "46 per cent. of these girls had chosen as their spouse a man between 5 and 16 years older than they were". It might be interesting to find the main difficulties a girl experiences when she is first on licence after a long period of certification, so that a training programme for pre-licence girls could be organized, if only lasting a few weeks or months.

DISCUSSION

It is important to decide whether these mothers really are properly described as feebleminded. Even if they are not, are they typical of the certified "feebleminded" patients in other institutions?

Feeblemindedness has often been loosely defined and it has sometimes been implied that a feebleminded person is someone who is certified as feebleminded. Porteus (1941) stresses the need to demonstrate that a person is socially inefficient before he can properly be called defective. Also as feeblemindedness is usually taken to imply intellectual defect it should be demonstrable by standardized tests. Definitions of feeblemindedness usually contain references to both social inefficiency and low intelligence. Do the women in this survey come under the heading of feeblemindedness? Many of them were transferred to the Fountain Hospital at various times from other institutions. They were regarded as being able to do a certain amount of simple work within the hospital, but their previous institutions did not consider them suitable for licence. All these girls have been certified and most have been considered social failures. This term covers too wide a category and needs limitation by reference to intelligence. Out of the 70 girls tested, only 9 scored consistently below I.Q. 60. Thirty women scored consistently above I.Q. 60. Thirty-one women had scores both above and below 60.

It will be seen that two arguments can be developed to explain these results. In the past with a Terman-Merrill test administered by someone other than a psychologist well over half of these women might be labelled feebleminded on the results. This group are probably quite comparable with so-called feebleminded patients in many other surveys. On the other hand, with more reliable techniques and other tests, 61 out of the 70 had one I.Q. of over 60. Therefore it could be argued that the majority are not really mentally deficient at all. They are a dull group who have been dealt with under the Mental Deficiency Acts because this was expedient. If most of them are not feebleminded intellectually there is no genetic reason why their children should not on the whole be normal. It will be seen that there is a case for either point of view. By altering one's definition and the tests used, this group may or may not be suffering from mental deficiency. The more crucial question is whether these women are typical of those found in other mental deficiency colonies. If so, these results can be directly compared without defining feeblemindedness.

The distribution of the intelligence of the women in this survey does not seem to be very different from that found in other institutions. Over the last ten years there has been a change in policy with these brighter women and many more are rehabilitated now than in the past. This makes any direct comparison difficult. However, two points can be made. First, these girls are similar to those in other institutions because most of them came from other colonies to the Fountain Hospital. Secondly, one must consider the results of the surveys carried out by Tizard and O'Connor (1956). In several recent studies they have found that the average I.Q. of representative groups of adult institutional feebleminded persons is just over 73. The average I.Q. of the women in this survey is 73·5. They also found that two-thirds of the adult institutional feebleminded had I.Q.s between 60–80. Using average I.Q.s for the women in this survey, that is, averaging the I.Q.s they obtained on the Wechsler-Bellevue, the Progressive Matrices and Terman-Merrill, a third had I.Q.s above 80 and two-thirds below. The figures in percentages were average I.Q. between 60–80=48·6 per cent., average I.Q. above 80=32·9 per cent., and average I.Q. below 60=18·5 per cent. Although it can be argued that these women are not all feebleminded, they are similar to those labelled feebleminded in other institutions.

CONCLUSIONS

Women with intelligence quotients on the Terman-Merrill test in the 50's and Wechsler-Bellevue test in the 70's do seem capable of bringing up a child and running a home.

SUMMARY

Feeblemindedness was first considered as a major problem at the beginning of this century. Genetical assumptions were then made about the children of mental defectives. Early studies carried out on the parents of mental defectives stated that as many as 73·3 per cent. were defective themselves. Studies carried out on the children of mental defectives claimed that up to 69 per cent. were defective. Some of these studies do not define what constitutes a mentally defective person. Intelligence tests on both parents and children were rarely used.

In this survey a study was made of 73 certified mentally defective mothers and their intelligence was considered. It was shown that in every case but one, these women had had a physical, emotional, economic or an educational handicap in their youth. Nearly all are now working in the community. A survey of the married women found that they were at least average, for their broad social group, when rated as wives, housewives and mothers. It is discussed whether these women are a typical feeble-minded group.

ACKNOWLEDGMENTS

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APPENDIX I

SOCIAL RATINGS

(*A*) Five-point rating scale used for mothers as mothers, i.e. when caring for their own children.

(1) Mother has no idea of handling, she rejects one or more of her children, she is hostile to them or they lack both physical and emotional welfare.
(2) Mother makes mistakes in handling. She has either a lack of affect or is overprotective towards the child. The child has two or more emotional symptoms, i.e. enuresis, fear of the dark, nail biting, and feeding difficulties in the older children.
(3) Mother seems fond of the child, but may be rather flattened or overprotective, the child may have one not more emotional symptoms.
(4) Mother obviously proud and fond of the child and shows the child affection.
(5) The mother-child relation is extremely good.

(*B*) Five-point scale ratings used for mothers as wives, i.e. in the happiness of the husband-wife relationship.

(1) Separated because of unhappiness together or have separated more than once.
(2) Fairly constant rows, couple are unhappy, may have left each other once but are now together.
(3) The couple are together, there is not a great deal of affect between them, they have quarrels, but have no thought of ever leaving each other.
(4) The couple seem contented and fond of each other.
(5) They are obviously extremely fond and think highly of each other.

(*C*) Five-point rating scale used for mothers as housewives, i.e. the standard of general cleanliness and care of the house and children.

(1) Manages so badly that one feels action should be taken such as calling in family service units, children look very unkempt.
(2) Obviously finding children and home difficult. Children do not look well cared for.
(3) Housework is done, and she is managing, children look fairly clean and tidy.
(4) The house and children look clean, tidy and well kept on the whole.
(5) There are definite signs of good housekeeping, she obviously takes a pride in her house.

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THE INTELLECTUAL AND SOCIAL STATUS OF CHILDREN OF MENTAL DEFECTIVES

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PART II

INTRODUCTION

THE purpose of this survey was to assess the intellectual and social status of 150 children of 73 certified mental defectives. The mothers have been described in Part I.

THE CHILDREN

(*a*) DESCRIPTION OF GROUP

Number. One hundred and fifty children (including some miscarriages and stillbirths) were known to have been born to these certified women. Two of these have been born during the last three months and have been excluded in all calculations dealing with intelligence. They both appear to be perfectly healthy babies. All the other children are over six months old. Seventy children were seen by the writer, 60 of these were tested. Thirty-nine were not seen, 14 of these had already been tested by a psychologist. Those remaining were not seen because they were adopted, abroad, or it was not considered advisable to visit. However, a considerable amount of information was available about all but 7 adopted children and one child who, when last heard of, was being considered for adoption.

Deaths. Forty-one of these children have died, 2 at 7 years and 2 as adults. The remainder, 37 or 24·7 per cent. of the whole group, were miscarriages, stillbirths or died before they were two years old. This percentage is similar to that of Lewis (1934) who, in a group of 8,841 children of defectives, found a death rate of 22·5 per cent. An inquiry was made into the causes of death in the present group. All the hospitals where a death was known to have occurred were asked to give the cause. Unfortunately, in most cases, this appeared to be impossible, owing to records being lost or destroyed. Four of the children who died were known to have been abnormal physically. These are given below with the mother's Wechsler test I.Q.

Mother's I.Q.	Child's Abnormality
73	Anencephaly
91	Hydrocephaly
69	Mild microcephaly
73	Large soft swelling on side of head

In only 4 other cases was the cause of death known. These were: bronchopneumonia, jaundice, prematurity and breech with extended arms and prolapse of the cord. The cause of death is an important aspect which should receive more attention. The death rate over the last five years is still far higher than the national average. The contributory causes of death, whether hereditary, or environmental, might be very revealing. In Table I the dead children are included at the age they would now be (31 December, 1956) if they had lived.

TABLE I

Age and Death Rate of Children

Age	0–5	6–15	16–20	21–24	25 and Over	Total
Number dead*	6	9	2	2	22	41
Number alive	51	26	3	8	21	109

* Age would have been 31 December, 1956.

The number of deaths has decreased over the years. Comparing those born during the last five years, and those before, there is a significant difference in the death rate. $\chi^2 = 11 \cdot 75$ $p < \cdot 001$. This is probably due to some considerable extent to the national decline in infant mortality. The fact that the figure has improved with that of the general population indicates that the high death rate is not wholly an inherited and unalterable characteristic of this group. The number of illegitimate children has a bearing on this problem and will be mentioned later.

(*b*) INTELLIGENCE

Tests used. It was hoped to use the Griffiths developmental scale for those under 2 years, the Terman-Merrill 1937 Revision of the Stanford-Binet, Form L. for those from 2–14 years and the Wechsler-Bellevue Form I for all those above 14 years. However, this was not always possible. With the adults it was almost exclusively those who had been in institutions who were available for testing. For the remaining adults, estimations were made on school record, past and present occupation and general conversation. It is realized that this method is not very satisfactory; however, it does lead to under rather than over-estimations. The following is an example of a girl who was rated as having average intelligence. She had been brought up in an orphanage and was better than average at secondary modern School. She taught herself to type and was "discharged" from the care of the Local Authority at 18 rather than 21, because she was thought capable of managing for herself. She kept herself by secretarial work until she married and now runs a home quite efficiently. (See Case A.F.C. Appendix I.) The estimations were:

average plus I.Q.	110
average I.Q.	100
average minus I.Q.	90
average double minus I.Q.	80

(in fact this latter estimation was not given, as intelligence test scores were available in all doubtfully low cases).

When it was possible more than one test was given. With some of the older foster children, it was felt by the Children's Officer that an intelligence test might be disturbing for the foster mother and child. In these cases, the children's officer gave a full description of the child, and was asked to get a drawing of a man under conditions where it could be scored as a Goodenough test. One hundred and nineteen tests were given to 74 children. The tests were all given during the last year so that the ages in Table I are also the age when tested. The following tests were used: 17 Griffiths mental development scale, 40 Revised Stanford-Binet intelligence Scale Form L, and 7 Wechsler-Bellevue Intelligence Scale, Form I, 13 Progressive Matrices, 9 Goodenough draw-a-man test and 33 Vineland social maturity scale. The Vineland test was used mainly for children under two years of age. It was decided to take the score of the test best suited to the child's age where one of the first three tests mentioned was available. When they were not available, the other tests noted above were added in, in the order mentioned above. An alternative method was used of averaging the I.Q.s for each child where more than one test had been given. Thus, a 20-year-old daughter (F.M.A. Appendix I) with the following scores: Wechsler-Bellevue I.Q. 81, Terman-Merrill I.Q. 72 and Progressive Matrices I.Q. equivalent of 75 is given the Wechsler I.Q. of 81 by the first method, and an average I.Q. of 76 on the second. McNemar (1942) and Roberts (1952) corrections were used for the Terman-Merrill scores. To these results were added the estimates. There were 27 of these. There were also 7 children who had been adopted. On the basis of those known I.Q.s for children who had been or who were being considered for adoption, these children were estimated as having I.Q.s of 95.

Results. Of the 109 live children, 74 were tested. The average for all the intelligence test scores was 89·1, using the first method described; that of taking the I.Q. as scored on the test best suited to the child's age. When the total of 34 estimates were added, this came to I.Q.=91·3 for 108 cases, Range 30–132 SD. 17 (2 cases were included who died as adults, but who had had an intelligence test and an estimation; 2 children were excluded because they were less than three months old and one child could not be traced). This child, when last heard of, was normal and was being considered for adoption. Using the second method, that of averaging all the intelligence test scores, the average was 90·5. When estimates were added this came to 92·2. Yet a third method of

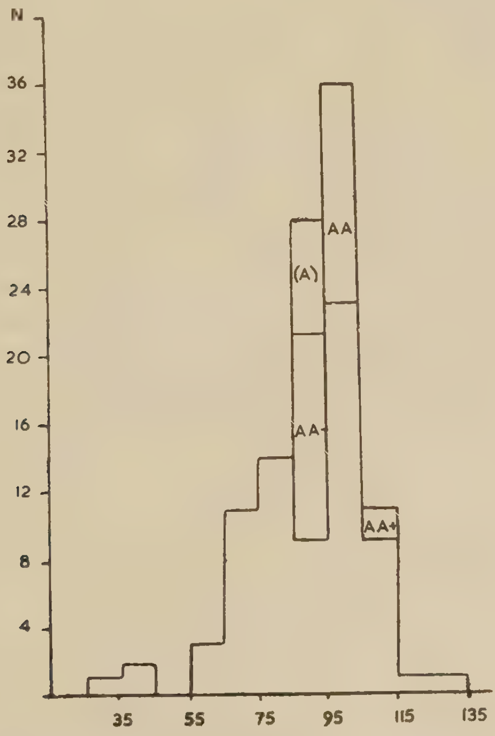

FIG. 1.—Distribution of intelligence of 108 children of women certified as Mental Defectives. Intelligence test scores converted to an S.D. of 16 points. Mean I.Q. of test scores=89. Mean of I.Q.s plus estimation=91·2.

dealing with these results is to take the scores obtained by the first method and to convert them via Standard scores to the same standard deviation. Converting all the scores to a standard deviation of 16 points, the mean I.Q. is 89 and the mean I.Q. plus estimates is 91·2. The scores obtained by this method are illustrated in Figure 1. The method of taking the highest I.Q. on any of the tests has been used by Charles (1953). In the present survey it gives an average I.Q. of 93·7, which gives a mean of 94·5 when estimations are added. It would appear from these results that these children's intelligence on the average is within the normal range. The four methods produce average I.Q.s for the whole group of 91·3, 92·2, 91·2 and 94·5. In the survey by Ainsworth, Wagner and Strauss (1945) the mean I.Q. of the 15 children in their group was 91·1 which is very similar.

Although it is interesting to find the average intelligence of a group such as this, a more detailed account of the results is needed to give a true picture of their intelligence. The results when looked at in detail present some rather surprising features. The mother with the highest I.Q.=113 produced one of the defective children I.Q.=44, and the mother with the lowest I.Q.=55 (Wechsler-Bellevue Scale) has produced the child with the highest I.Q.=132 (Terman-Merrill).

Of the 109 children still alive:

6 had been certified as mentally defective, but are now discharged and self-supporting;
2 were in places of safety under the Mental Deficiency Acts, and have now been discharged;
$\left.\begin{array}{l}\text{6 are still certified and have I.Q.s of 30, 40, 44, 56, 73 and 84}\\ \text{4 are in schools for the E.S.N. with I.Q.s as described later}\end{array}\right\}10$

Thus 99 or 91 per cent. of the surviving children of these allegedly mentally defective mothers are apparently mentally normal. Only 6 children scored consistently below I.Q. 70 and only 4 below I.Q.=65 (3·7 per cent.). It could be argued that one of the four defective children comes from parents with above average intelligence and so should be excluded. This would bring the percentage of seriously defective children to 2·8. The percentage of mental defectives in the total community is still being discussed. Lewis (1929) estimated that the general incidence was about 8·6 per thousand with wide fluctuations when the age groups were separated, the highest figure being 3 per cent. at 12 years of age. The Scottish Survey (1933) indicated that more than 1·5 per cent., but not as many as 3 or 4 per cent., of school children were mentally defective. A more detailed study of those children with lower intelligence is made below. First, those who are certified as mentally defective; in each case the possible social and hereditary reasons for the child's defect have been divided from the possible physical ones. Cases 5 and 6 belong to the borderline group rather than that of the true mental defectives.

Children Certified

(*a*) possible social and genetic factors.
(*b*) possible physical causes.

1. M.B. I.Q. 30. Aged 8.
   (*a*) Father was a defective on licence, mother's twin sister was an imbecile.
   (*b*) Grandmother tried to procure his abortion.

2. M.C. I.Q. 56. Aged 6. A very disturbed child.
   (*a*) Mother was schizoid and grandmother was voluntary patient at a Mental Hospital—a neurotic. Mother's twin sister has a Wechsler I.Q. of 68.
   (*b*) Nothing relevant known.
3. S.P. I.Q. 48. Aged 9.
   (*a*) Father was a skilled foundry worker. Mother was an orphan, she has an I.Q. of 113 (Wechsler) so that factors leading to her certification were not wholly intellectual.
   (*b*) Nothing relevant known.
4. D.B. I.Q. 40–48. Aged 19.
   (*a*) Nothing relevant known.
   (*b*) Fits as a baby.

The above four children have all been patients in the Fountain Hospital.

5. L.H. Aged 20. Goes out on daily licence.
   Wechsler I.Q. 73. Verbal I.Q. 65. Performance 87. This man is more of a social problem than an intellectual one with an I.Q. as high as this.
6. G.D. Aged 25. Wechsler I.Q. 84. Matrices I.Q. 86.
   This man is certified as a mental defective, although according to the medical report he has a schizoid personality. He has earned his living for short periods, but again, his main difficulty is not his deficiency.

Those children who have been under the Mental Deficiency Act and are now discharged are as follows:

1. R.B. Aged 34—earning £10 a week, slight speech defect, runs a house and goes out to work—very capable.
2. G.C. Aged 32—now earning his living and married. He was admitted to a Place of Safety and ran away, so was discharged.
3. J.D. Aged 28—brought up in an institution, now married, rather headstrong, but appears to be managing her life.
4. F.G. Aged 22—working in a hotel, has just been discharged.
5. M.P. Aged 31—working as a ward orderly, seen and is quite independent and competent.
6. P.J. Aged 25—about to be discharged. Matrices I.Q. 84. Mainly kept in because of tuberculosis—now clear of this.

These children were all brought up in the care of local authorities. They could not afford to appear dull since on practically every case sheet it was mentioned that mother was a certified mental defective and they were literally watched for signs of defect.

E.S.N. Children

The 4 children who are attending E.S.N. schools are a further interesting group.

The incidence of true feebleminded children rather than idiots or imbeciles in such a group is probably the most important consideration in a survey of this type. If it could be shown that certified feebleminded mothers produce large numbers of educationally subnormal children, then the fears of the eugenicists would be justified and there would be a danger in allowing these girls to make normal emotional attachments and marry. However, the only 4 children in this category appeared to be basically normal children who had undergone extreme lack of mothering in their early years. Bowlby (1951) has reviewed the researches carried out on maternal deprivation and suggested that a lack of mothering can depress children's intelligence quotient by an average of 20 points or more. It will be seen later that in the present survey, those children separated from their mothers appear to have a lower intelligence than those who have remained with them. Recent researches have tended to find fewer certified children and a higher mean I.Q. among children of mental defectives. This may not only be due to more exact research methods. Many more children are now allowed to stay with their mother or are adopted or fostered immediately after birth rather than sent to large institutions because they were considered to come from "bad stock". Griffiths (1951) has also observed the effects of a lack of mothering on the development of very young children. Mundy (1955) has studied the question in relation to mental deficiency specifically. Bourne (1955) also notes it as a factor in the possible aetiology of a residual group of mentally deficient children. Penrose (1954), in concluding his chapter on problems of causation, writes: "the postnatal environment can contain decisive psychological factors tending to cause or prevent the development of mental defect." These particular children may be susceptible to the effects of institutional upbringing. This is, however, quite different from postulating an innate inability to learn inherited from their mothers. It does seem that these four children in this present survey are suffering from a reversible and probably preventable state of being "E.S.N.". They are described in detail. Three of the four have been through the same residential E.S.N. School. A letter was written to the principal asking how these children were progressing. The following descriptions of them were given:

P.S., aged 7. "An extremely highly-strung and nervous little boy, delicate, small physique, expressive face, and quaint amusing mannerisms and conversation render him popular among adult visitors. He is not always amenable to discipline, likes his own way and gets it often in a roundabout way, is at times aggressive and unco-operative in a baby way resembling the behaviour problems of a three year old. He will fasten his loyalty on one person and becomes extremely lovable and endearing towards the object of his affection, often addressing her as 'my Manny'. His insecurity is also shown by his appropriation of small objects which he will hide and hoard, regardless of ownership. In the class he has shown little progress in the two terms he has been here, cannot concentrate for long, but wanders around. As he is very young in age and insecure, he may yet show a latent development. His mother's mother has visited him since he has been here and we are trying to cultivate the contact for his sake."

H.H., aged 11½. "Is a child with a definite chip on her shoulder, will not conform to rules and quarrels with the other children. She is extremely backward in the classroom, cannot concentrate, and it is very difficult to persuade her to attempt her lessons. If not given individual attention, she will sit and dream. Any mental concentration is difficult for her and the lack of ability in this way may be the cause of her behaviour problems and disturbance, although many of the staff members have tried to mother her, she has shown no affectionate inclination towards anyone. Her reasoning power is very limited and she can only understand her own point of view, is decidedly unpopular among the other children. This child is given as much individual attention as it is possible in a community, has a room of her own, and has had her own animals."

J.F., aged 11. "Lives largely in a fantasy world except when stimulated by classroom activities. J. is a live-wired boy who needs firm discipline to make him adhere to routine. He is highly imaginative, egocentric, and anti-social, not easy to handle. Up to last summer he had never shown the least sign of affection for anyone but himself. He seemed utterly incapable of love, perhaps because he had always been the *bête noire* of the staff who had had to cope with him. During the summer he showed great interest in the two-year-old child of his house matron and became extremely fond of her. At the same time he also intimated that he was going to marry his teacher because he loved her. This was a great step towards security for J. Unfortunately he was transferred soon afterwards while this new outlook towards others was still a new thing. His work in the classroom was interesting. He had many creative ideas, showed extreme care, neatness and enthusiasm in his writing and number work and had a rare feeling for design in colour in his art work. The general feeling here was that he was more maladjusted than E.S.N. The topic of his conversation was often his loss of family and mother."

M.G., aged 6½—has only just gone to Special School. She is described by her house mother as "very quiet and withdrawn and frightened of being alone".

As the intelligence test scores of this E.S.N. group appear to be rather variable, these have been given in detail in Table II. It will be seen that these children have much higher performance scores than verbal ones.

TABLE II

Verbal and Performance Scores of E.S.N. Children

Name	Age	Mainly Verbal Tests		Mainly Performance Tests		
		Terman-Merrill	Wechsler Verbal	Goodenough	Matrices	Wechsler Performance
M.G.	6½	64	—	83	—	—
P.S. ..	7	67	—	—	71	—
J.F. ..	11	63	71	112	82	98
H.H.	11½	65	57	—	—	67

The tests of two of the children show wide variations and this is one of the recognized signs of emotional disturbance. All four children were seen and tested by the writer. They did not present the textbook picture of slow, dull feebleminded children. All four move and think quite quickly, but have difficulty in personal relations. It should be emphasized that at the moment these four children are in extremely good environments as far as can be provided by a large boarding school. From the report given above it can be seen that a considerable amount of individual attention has been given to them. It would be most interesting to follow the subsequent careers of these four children.

To try to assess the effects of continual moves and lack of home life, a note was made of those children who had been away from home for long periods and who had full siblings living at home.

TABLE III

Comparison of Separated Children's Intelligence with that of their Own Siblings

Mother's I.Q.	Child	Position in Family	I.Q. of Child	I.Q. of Siblings with Same Father
72 (T. and M.)	J.A.	3rd child	80	104, 96, (100)
68 (V.W.-B.) ..	R.B.	2nd child	77	85, 85
71 (V.W.-B.) ..	C.F.	1st child	(90)	(100), (100), 108, 100
84 (Full W.-B.)	R.S.	2nd child	90	104, 100

Figures in brackets represent estimates.

It is strongly suspected that adverse environmental factors have held back at least three other cases, but amongst these there are no full siblings to act as controls (see F.M.A., Appendix I). The group is too small to make any deductions, but it is possible that lack of family life has had a depressing effect on the development of their intelligence. The average difference between those who have been at home and those who have not is about 14 points I.Q. Birth order does not seem a relevant factor. Mundy (1955), dealing with a similar group writes: "the hypothesis is submitted that adverse social circumstances may exercise an inhibitory or depressive effect on intellectual function and that this appears to be a reversible process."

(*c*) ILLEGITIMACY

For the whole group the illegitimacy rate is high: 30 or 20 per cent. are legitimate and 120 or 80 per cent. are illegitimate. Ten of the nominally illegitimate children are, however, "legitimate" in that there is a stable home. The death rate in infancy in the two groups is significantly different: $\chi^2 - 12 \cdot 84$ $p < \cdot 001$. Early separation and multiple placements which occurred frequently may have been responsible for the high death rate. However, the birth dates of the dead illegitimate children are earlier than that of the live illegitimate children. The illegitimate children who died would now have an average age of 23, whilst those who are alive average 16 years. It is difficult to judge to what extent improvements in ante and postnatal care and possible social tolerance are responsible for these differences.

The Comparative Death Rates of Legitimate and Illegitimate Infants

	Legitimate or Appear Legitimate	Illegitimate
Number	40	110
Number died in infancy ..	1	36
Percentage dead	2·5%	32·7%

The death rate is much higher for the illegitimate children: it might be argued that these probably come from less intelligent parents, because the more intelligent would be more likely to marry. However, when the married mother's I.Q. on the Wechsler test is compared with that of the discharged unmarried mothers, it is found to be slightly lower. The married women have an average I.Q. of 80·6 and the unmarried 82·3. The women whose children all died were only a small group but their average I.Q. was just as high.

(*d*) MODE OF UPBRINGING

Four children have been brought up mainly in mental deficiency institutions, seven children have been adopted, two children, the youngest in the group, will probably be brought up by their mothers, and five have had a rather mixed upbringing and are now with their mothers.

Apart from these the rest were brought up as shown in Table IV.

TABLE IV

Mode of Upbringing and Intelligence of Children

Mode of Upbringing	Number	I.Q.
Brought up by their own mother	30	98·7
Brought up by 1st or 2nd foster mother, a close relation, or adopted after being tested	25	96·8
Brought up in orphanages or by a succession of foster mothers	38	87·6

There may be various selective factors operating on these groups, but it is interesting to note that being brought up by a discharged mental defective does not appear to depress the children's level of intelligence.

(*e*) PRESENT OCCUPATION

Thirty-four of the children are over sixteen; 21 girls and 13 boys. Their occupations have been grouped roughly in order of difficulty below:

			Number	
(1)	Men	In mental deficiency hospitals (patients) ..	3	3
	Women	In mental deficiency hospitals (patients) ..	0	
(2)	Men	Farm or general labourers, hotel work ..	4	13
	Women	Domestic, ward orderly or laundry work	9	
(3)	Men	Baker, soldier	2	6
	Women	Shop assistant, factory work	4	
(4)	Men	Farm foreman	1	5
	Women	Typist, nurse	4	

In addition, one girl will probably be discharged and do domestic work, 3 women are now housewives and their previous occupations are not known. Three of the men have been adopted and their occupations are not known. Out of the 34, 13 of the women and 4 of the men are now married. There are 27 grandchildren, of the original mothers, some of these have been seen and inquiries have been made about all of them. They all appear to be healthy and although they are mostly young, none is considered dull or backward.

(*f*) CORRELATION BETWEEN THE INTELLIGENCE OF PARENTS AND CHILDREN

The correlation between the mother's Terman-Merrill I.Q. and the child's for 77 cases was found to be ·14. The correlation between the mother's Wechsler score and the child's I.Q. for 65 cases is found to be —·008.

The occupation was known for 54 of the fathers. They had 80 of the 150 children, 14 of whom died. The fathers' occupations were divided into five groups as shown in Table V and given intelligence quotients for each level. These were taken from Burt (1926).

When the parents' scores were averaged and compared with the children, the correlation was ·0008 for 66 cases. There appears to be little or no correlation between the parents' intelligence in this group and the children's. When the data are grouped, however, the duller mothers appear to produce more of the defective children than the brighter ones.

TABLE V

Occupational Level of Fathers

Number of Fathers	Father's Occupation	Total Number of Children	Number of Live Children	Number of Children Who Died
3	Certified defective ..	3	2	1
6	Casual labourers	11	8	3
13	Unskilled labourers ..	20	18	2
21	Semi-skilled workers ..	32	28	4
8	Skilled workers	11	8	3
3	Highly skilled workers ..	3	2	1
54		80	66	14

MOTHERS WITH CERTIFIED SIBLINGS

Eighteen mothers have certified siblings. The average I.Q. of these mothers is 76 which is very similar to the I.Q. for the whole group, 73. The children's I.Q. is 89 which is also not very different from that of the whole group, 91, so that it might be inferred that having deficiency in the family does not affect the intelligence of the children. However, the 25 children in this group contain a large number of those who have been under the Mental Deficiency Act. The group contains 3 of the 5 children who are now certified, 3 of the 6 discharged cases and both of the place of safety cases, and 2 of the 4 children who died in infancy and were physically deformed. Some of these have quite low I.Q.s and in order to produce such close averages with the total group, it seems possible that there are two factors operating here. There are those nine mothers who are backward because of factors operating early in development and who have dull siblings and tend to have certifiable children. Some of the children, however, may have been more easily certifiable because "there was deficiency in the family". The average I.Q. of this group of nine children is 73 and their mothers 64. On the other hand, there is a group of nine mothers who come from very adverse homes (see B.B., Appendix I). Here the same disadvantages are acting on all the family and it is very likely that a number of siblings will be certified whilst being of fair potential intelligence. This group of nine mothers had an I.Q. of 87 and their 14 children had an average I.Q. of 100. This is seven points higher than that for the whole group. It will be seen that although there appears to be a cluster of duller children coming from families with more than one person under the Mental Deficiency Act, great care needs to be taken before it can be assumed that there is a "deficient strain" in the family.

DISCUSSION

It has been pointed out in Part I that eugenic statements have sometimes been rather wild. Even geneticists have looked on feeblemindedness as a single disease or unified syndrome. Statements are still being made which show the earlier type of loose thinking to be prevalent. Pantin (1957) writes: "of two feebleminded parents, nearly all the children will be feebleminded" and such debatable statements as "three-quarters of all types of mental deficiency are genetically determined". Penrose (1954) discusses the whole question of genetics and intelligence and goes into the problem in relation to mental deficiency. There seem to be four main verified statements which have been made about genetics and intelligence. The first, that certain specific diseases appear to be gene-determined. These are often accompanied by mental deficiency. Examples are phenylketonuria and amaurotic familial idiocy. The majority of those recognized lead to imbecility and idiocy and not to feeblemindedness and account for a small fraction only of mental defect. Secondly, there appears to be a fairly constant relation between the intelligence of parents and children. The correlation is often quoted as being in the order of ·49 (Jones, 1946). Thirdly, there is a tendency for the intelligence of children to regress toward the mean, Thompson (1946), and fourthly, there tends to be a greater variation in the children's intelligence than in the parents. How do the results in this research compare with these known facts? The mothers in the present survey suffer from no known genetically determined illness. When the mothers' intelligence is correlated with the children's the correlation is found to be very low. This may be due to two factors. The mothers have been shown to have very divergent I.Q.s with a marked tendency to increase; there is no guarantee that they have finished maturing and that we now have their highest and "real" I.Q. In fact, after an adverse home background and an average of 14 years in institutions, it would not be surprising if they never develop their full capacities. This does not alter their genetical make-up. They can still be passing on genes capable of producing normal intelligence. The second factor is that one is dealing with a selected group, a relatively narrow band of I.Q.s, and one would expect the correlation to be smaller because of this. The high correlation between parental and child intelligence does not hold true right the way down the scale. Penrose (1938) in his survey stated that the idiots and imbeciles did not have dull parents. Possibly there is a point or a range of I.Q.s where this correlation becomes smaller. Alternatively, because of the regression towards the mean, the correlation may remain constant, but with the children's results always tending to be higher than the parents. However, almost all idiots and imbeciles have grossly abnormal brains. They are not just the normal swing from their parents' intelligence. It is very difficult to draw any upper limit for this process.

The third point about regression towards the mean has been shown in this research. If some of the children had not themselves been subject to adverse environment this regression might have been even greater. The fourth point, that there tends to be greater variation in the children's intelligence than in the parents', is also illustrated in this survey. When all the test scores are used, the mothers' I.Q. ranges from 43–113 (70 points) whilst the children's range is from 30–132 (102 points).

Conclusion

Women who have been certified as feebleminded do not appear to have large numbers of defective children. In the present survey the number of defective children is 3·7 per cent.

Summary

Among the 150 children of the certified mental defectives discussed in Part I, a high death rate was noted. Their average intelligence was found to be I.Q. =91·3. Only 4 children scored consistently below I.Q.=65 (3·7 per cent.). The suggestion was made that the small group of educationally subnormal children might be functioning at a low level because of adverse upbringing. The intelligence of those children who had been separated from their homes was compared with that of their full siblings at home. Although the group is small, the I.Q. was found to be consistently lower for the separated children. It was suggested that a number of other children in the group had also been adversely affected by constant changes and lack of mothering. Children brought up by their own mother had an average I.Q. of 98·7. Upbringing by a discharged mental defective does not appear to depress the child's intelligence unduly. The occupations of the children over 16 were described. Mothers with defective siblings appear to belong to one of two groups: one having dull children and the other normal.

The correlation between the mother's and child's intelligence was found to be ·14. When an estimate was made for the father, the correlation between parents and child was ·0008.

The mothers in the present survey suffer from no known genetically determined illness. There is a low correlation between the mothers' intelligence and that of her children. The children's intelligence shows a regression towards the mean and a greater variation than their mothers.

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APPENDIX I

Individual Case Histories

F.M.A.

F. was third of 17 children, 8 of which died before they were two. Her father was a packer who earned 60s. a week in 1938. Her "abnormality" was not noticed until she was 8 years old. Her mother was described as difficult, unreliable and incompetent. One of the children attended an M.D. school and was certified.

F. is described as having wasting, eczema and chronic blepharitis. She was premature (7 months) and has defective vision.

At 8 she was sent to an M.D. special school and left at 16. She was then under supervision. At school she was described as quiet and industrious, but occasionally hysterical and later reports said she was untruthful, cunning and sullen, always talking to men. On leaving school she helped at home and had one job as a case maker for nearly a year.

She had one stillborn child when she was 24, the father being a married man, but nothing else is known of him and two years later she had a baby the father of whom was said to be her brother. This brother had "wasting" but was not one of the certified children. He worked in an iron foundry and later went into the Army.

After the second child, the family rejected her, and mother said she did not want anything to do with her. F. was with her baby for 7 months and became very attached to her. They were to go to a Rescue Home, but the child had gastro-enteritis and a rash, and they were separated. She was then found neglected and certified. She was in institutions until she was 35. She was then on licence for two years as a ward maid and was discharged when she was 37. She is still working as a ward maid at 56.

The daughter had 10 moves before she was 3 and a further move just after her third birthday. She was at one time considered for special school, but her I.Q. was found to be 86. She left school at 15 and wanted to do domestic work in hospital, but was turned down after a month's trial at a housecraft training school. She then went to a convent for training but began to have a series of hysterical outbursts and to show defiant "disobedience". She appeared extremely passive apart from these aggressive periods, but seemed to be deteriorating and became destructive. She also ceased to take a pride in her personal appearance. The Sisters felt unable to continue to care for her and asked for her removal. She was admitted to a hostel as a temporary measure and medically examined and deemed not to be M.D. She was then admitted to another convent where she stayed for 2 years doing laundry work. As she was approaching the age of 15 years she was re-examined with a view to being placed under supervision, but was still deemed not to be feebleminded. A situation was found for her as a ward maid, but whilst there she became pregnant. She said she had met a man and after two days became pregnant, that she had known nothing whatever about sex. She was again seen with a view to certification and her I.Q. was found to be 72 on the Terman-Merrill, 73 on the Matrices and 81 on the Wechsler Full Scale with a Performance I.Q. of 91. Eventually the idea of evoking the Mental Deficiency Act was dropped and she obtained resident employment as a maid.

The daughter was extremely difficult, but her reaction at 15 years to the convent life was hardly abnormal, especially after such an insecure childhood. For the time being the tragedy of repeating the same pattern for child as for mother has been averted. The mother almost certainly had a brighter potential than her Terman-Merrill I.Q. of 60. This test was given when she was 35, and to compare it with one given at 15 she would have at least another 4–5 points added for deterioration.

B.B.

B. is the fourth of 13 children, 11 of whom are living. Her father is a farm labourer, a cowman. Her parents were convicted of wilful neglect of six of their children who were taken into care by the County Council. The eldest child at 17 was on probation away from home. The next child, a girl, was certified as feebleminded. She is a little duller than B., but her case is rather similar: her I.Q. is 82 on the Matrices. She was brought before the court by the N.S.P.C.C. One other sister attends special school. B. led a rather nomadic life with her parents and did not attend school very regularly. At elementary school she was backward and her scholastic attainments poor. In the year before B. was certified they moved seven times.

B. was physically fit and was given I.Q.s of 69 and 72 before she came to the Fountain. She had been on probation for larceny, examined and deemed not subject to be dealt with under the Mental Deficiency Acts. But after she had been at the approved school for 4 months an order was made under Section 9. She was then 16. When she was 17 she came to the Fountain Hospital where it was found that she had a Wechsler I.Q. of 97 and a Matrices I.Q. of 95. After three months she was sent out on licence, and after a further seven months she was discharged. Five months later she married a farm labourer and seems to have settled down well. A year after she was married she had a son, who has a Griffiths I.Q. of 108, and she is expecting another child.

She now seems a very capable person, her house is well kept and she looks after her baby well. She was very immature when she first came to the Fountain Hospital, but matured quickly.

I.C.

I. is the sixth of 9 children, the last one dying at birth. Her parents are described as being of poor mentality. She is said to have developed normally in infancy. The father works in an iron foundry. One brother has suffered from schizophrenia, but is now at home, another went to special school and is now under statutory supervision at home. Both are working. I. went to elementary school until she was 8 when she was deemed E.S.N. and sent to Special School. She left at 16 and was employed in several factories. She was under supervision. At 17 she became pregnant and the parents agreed to her being certified as they did not want it to become known. Three months after the baby was born the mother asked to have them both home and was allowed to. The father of her first child was still seeing her although the parents objected to their getting married. There were constant quarrels in the family. Eventually they were married and I. again became pregnant. The husband had tuberculosis and could not undertake heavy work—he went to a rehabilitation centre at one time. On the Matrices test he scored between 66 and 76. He was seldom able to obtain work. I. lived very near to her mother and was constantly moving from one home to the other, having rows in both. She came back to the Fountain Hospital at intervals for temporary periods. The Family Service Unit gave a great deal of help, but she still does not seem able to cope with the situation. Her husband has left her for long periods. She has had one further child by him and is expecting another. She is now nearly 24, he is 41.

On tests when she first came in she had a Terman-Merrill I.Q. of 50 and a Wechsler Verbal I.Q. of 63. Four years later she had a Terman-Merrill of 58 and a Wechsler Verbal I.Q. of 71. She was described as abrupt, dispirited and sullen. Depressed when being tested, insecure and of hysterical temperament. She is very dependent on her mother, has a violent temper and is quarrelsome.

Her eldest child has been brought up by his grandmother. He has attended a Child Guidance Clinic for some time, but is essentially a bright and stable child, somewhat upset by the constant quarrels between his mother and grandmother. He is now 6 and doing well at school. His Terman-Merrill I.Q. is 111. The other two children are with their mother and at 2½ and 3½ have I.Q.s of 97 and 98 on the Terman-Merrill.

I. would manage fairly well in spite of her limited capacity if her husband did not reappear at intervals and cause her repeated pregnancies.

A.F.C.

A. was the first of seven. Her father was a fireman, bringing home 50s. a week in 1931. A. was born prematurely. Her lack of progress was always attributed to a fall at birth. She was born with no one in attendance and her mother stated that, for the first three months, the baby screamed almost continuously. Childhood development, however, was said to be normal. She went to an elementary school until she was 7 and then to a Special School until she was 16. When she was a child she had measles, after which there was a convergent strabismus.

Her siblings are all quite healthy. She was employed as a domestic on leaving school and stayed at her last post for 3 years.

She was certified as feebleminded just before she was 21 as she was pregnant, under Section 6, "as in need of care and training". She only met the father of the child once and could say nothing about him. She received treatment for a positive W.R. just before this. Later tests were negative. She was 27 when she came to the Fountain Hospital and was then in good health. When she was 34 she went out on licence and was discharged when she was 39. She was in resident employment until she left one situation and was unable to get another. She then lived in a hostel and looked vaguely for jobs. She became confused and depressed, possibly through lack of proper food. She was again admitted at 43 to the Fountain Hospital for two months before going to another domestic post. After several months she became confused and was admitted to a mental hospital. The report from there is that she is usefully employed in routine work and that a certain amount of supervision is necessary, but her behaviour is amenable and quite sociable. Mentally, when at the Fountain Hospital, she was found to have a Wechsler Full Scale I.Q. of 85, Matrices I.Q. of 88 and a Terman-Merrill I.Q. of 67. She was able to read, but only write the simplest words and it was noted that she was slow and clumsy in all her movements. The mental hospital feel she is really a feebleminded patient who needs some support in the way of supervision.

Her daughter was brought up in a residential home. She had a number of jobs, but always moved to better herself. She "got by with typing" as she said, having taught herself, and she was considered capable of managing her own affairs at 18 rather than 21 by the Local Authority. She married a printer's assistant and they have one child with a Vineland I.Q. of 96. The family live in a prefab. and maintain a very good standard of living. The daughter is at least of average intelligence and her child, although only two when tested, seems at least average.

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EVALUATION OF A COMMON METHOD OF CONVULSION THERAPY IN BANTU SCHIZOPHRENICS*

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INTRODUCTION

THERE seems little reason to believe that schizophrenia in the Bantu differs materially from the disease in other races, and no one thus far has produced conclusive evidence of fundamental differences between the symptoms of African and European schizophrenics (1, 2, 3, 4, 5). Nevertheless, certain diseases common in Europeans, are rare in Africans (6, 7), others tend to run a different course, and the latter condition may perhaps apply to a somewhat variable disease like schizophrenia, especially considering the existence of certain factors which will be discussed.

In spite of the fact that manic depressive psychosis and schizophrenia are held to be distinct genetical entities (8), cases have occurred which clinically are difficult to differentiate. Therefore if the inherited constitution of a race is such as not to favour the development of manic depressive states, it may be argued that features of this disease will be rarer in the schizophrenics of such a race and hence that their prognosis, according to Gillies (9), will be poorer. Consequently it may be of importance that there is some evidence (2, 3, 4) that the incidence of manic depressive psychosis, as compared with schizophrenia, differs in Africans and Europeans, and that depressive psychosis in the African is rarer. Further evidence (10) of a lower incidence of affective psychosis in the Bantu is provided by the following figures published, of patients resident in all South African mental hospitals at the end of 1951; they were officially classified as follows: Europeans: 516 affective, 2,541 schizophrenic (16 per cent.: 84 per cent.). Africans: 353 affective, 5,319 schizophrenic (7 per cent.: 93 per cent.). For new admissions during 1951 the figures are: Europeans: 113 affective, 216 schizophrenic (33 per cent.: 66 per cent.). Africans: 138 affective, 683 schizophrenic (16 per cent.: 84 per cent.).

Other factors which may be thought to affect the prognosis of schizophrenia in Africans as compared with Europeans, are differences in the structure of the brain as reported by Vint (11) and the prevalence of physical diseases (12, 13, 14, 15, 16) such as syphilis, tuberculosis, under-nutrition, helminthic infestation and liver damage. The serum protein of Africans (7) has also been shown to differ significantly from that of Europeans. Intelligence, another factor thought to be of possible importance in the prognosis of schizophrenia, was investigated in the African by Oliver (17) who reported findings that suggested a lower average than is the case in Europeans; his work has however been criticized by Biesheuvel (18) and Marais (19).

Finally, there are environmental factors (20) of a psychological or emotional nature; these have not yet completely been excluded as of possible importance in the precipitation of a proportion of schizophrenic psychoses; it is only for a century that the South African Bantu have been in close contact with Europeans and it is generally recognized that they are at present in the acute stages of adjustment to a peaceful co-existence with the white people. Under such unsettled circumstances it may be expected that feelings of insecurity and emotional conflicts will be all too common. There is evidence (3, 4, 21, 22) which suggests that mental disorder is commoner among detribalized natives than among those who are tribalized, and psychoses into the development of which environmental factors entered, have been thought to show a better prognosis than those arising endogenously (23, 24).

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Considering the foregoing, the findings of Linford Rees (25) and others (24) as regards the relative merits of E.C.T. and of insulin coma, in the treatment of European schizophrenics from a stable community, cannot, without further evidence, be accepted as applicable to present-day Africans. A study of the results of convulsive therapy in the Bantu in its present state, should therefore not be without some interest and consequently an attempt was made during the period 1952–1954, to establish the value of a common method of E.C.T. in schizophrenic Bantu women, and to compare the results with those reported in the case of Europeans. The work was carried out at the Tower Hospital, Fort Beaufort, Eastern Cape Province. In the mental examination of the patients, interpreters often had to be used, and the values of the findings in the sphere of cognition are therefore probably lower than would have been the case otherwise. Before describing the technique of the investigation, the prognosis of schizophrenia in Europeans will be reviewed briefly, to facilitate a comparison of results subsequently.

The Prognosis of Schizophrenia in Europeans

The best method of treatment in this disease remains a subject of controversy after nearly 25 years of insulin and convulsion therapies and even the prognosis without treatment is not yet fully agreed upon. Nevertheless much evidence in elucidation of the problem does exist now. According to Shepley (29) and McGregor, "endogenous schizophrenia" characterized by cardiovascular hypoplasia, general asthenia and poorness of sex differentiation has a much poorer prognosis than the "exogenous type". Gold and Chiarello (30) found that gradual onset and long duration of illness indicated a poor prognosis, and sudden onset, short duration of illness and the presence of exogenous precipitating factors, were associated with a good prognosis.

Linford Rees (25) found that sudden onset and duration of less than one year, stable previous personality, and broad interests indicated a good prognosis, and gradual onset, unstable personality, simple and hebephrenic types, a poor prognosis, with either E.C.T. or insulin.

Alexander (31) stressed the time factor in judging results, and arbitrarily selected a period of 30 days after the last treatment, as the upper limit of time following treatment, during which remissions should be attributed to its specific influence, and found that many patients recovered after that period was over. Zubin (32) decided that the minimum essentials for comparability of two groups are, age of onset, duration of disease, sex and diagnosis. He thought that suitable rating scales before and after treatment, to determine the degree of improvement, might be the ideal.

Gillies (33), reviewed the subject and concluded that 25 per cent. of cases ended in severe deterioration, 25 per cent. in marked personality defect, 25 per cent. in mild defect and 25 per cent. recovered; he quoted Bleuler's study of 500 patients over a period of 15 years. Cook (34) concluded that statistical results of treatment in schizophrenia rested on too fluid a basis to be of any scientific value. According to him Muller (35) gave the average spontaneous remission rate for unselected cases of all types and duration of schizophrenia as being probably between 15 and 20 per cent. He pointed out that figures for recovery in cases of less than one year's duration varied from 40 per cent. to 70 per cent. for insulin treated cases and, 44 per cent. to 91 per cent. for cardiazol treated cases as reported by different workers. He concluded that it was probably justifiable to assume that between 55 and 60 per cent. of cases of schizophrenia treated with convulsions during the first year of their illness may be expected to remit sufficiently to return to their previous place in society. He added however that any complacency as to the results of convulsion therapy in schizophrenia must be shaken by the analyses of results at the New York state hospitals by Malzberg (1938), Pollock (1939) and Ross and Malzberg (1939), and which showed only very poor results: recovered and greatly improved 37·6 per cent. with insulin, 14·7 per cent. with conservative methods, and 11·5 per cent. with metrazol convulsive therapy.

Linford Rees (25) reported the results of E.C.T., of electronarcosis and of insulin shock in 160 schizophrenics, and found that insulin was the only treatment which gave immediate results significantly better than the ultimate results of conservative methods in schizophrenia. This confirmed the work of Mayer-Gross (36) carried out at the Maudsley Hospital.

It seems justifiable to conclude therefore, that in European schizophrenics whose psychosis had lasted 1 to 2 years, the spontaneous remission rate is about 25 per cent. and that with insulin this can be doubled; the value of convulsion therapy is open to more doubt, some workers having claimed equally good results for it whereas others found it to be of no value in producing recovery. However, the criticism of the insulin method made by Bourne (38), should not be disregarded.

METHOD OF PRESENT INVESTIGATION

Rating scales and item sheets were used after the method of Linford Rees (25, 27, 28) and the patients were divided into three groups:

(1) Fifty female Bantu schizophrenics admitted in 1943, before convulsion therapy was used at the Tower Hospital.

(2) Twenty-nine female Bantu schizophrenics admitted in 1953 and treated with 30 shocks at the rate of 2 per week.

(3) Forty-one female Bantu schizophrenics admitted in 1953, 40 of whom were treated with 15 shocks at the rate of two per week. All these patients were free from appreciable physical disease on admission, had a negative blood Wassermann, and in the case of groups 2 and 3, an E.S.R. within normal limits or not significantly raised. The data as regards age and duration of psychosis were probably not very accurate, for reliable histories were difficult or impossible to obtain. The terms Bantu, African, and native, are used synonymously and do not include Asiatics or Cape Coloureds.

Each patient in groups 1 and 2 had a form on which was reflected mainly in numerical terms her age, duration of psychosis, history and clinical status. In the assessment of the latter, the rating scale and item sheet were used routinely. The numerical expression of such factors as age and family history of mental illness, etc., was used in order to allow sorting the cases by means of Hollerith cards. The following items on the form were similarly rated (0=absent, 1=mild, 2=moderate, 3=severe): Family history of mental illness, personal history of conditioning towards maladjustment, pre-psychotic personality with abnormal traits, previous mental ill health, signs of physical ill health on admission, and history of possible psychological causative factors. The European influence rating was derived as explained further on. The speed of onset of psychosis was rated as follows: 1=slow, 2=moderate, 3=sudden.

Case 59 (group 3), was the only patient admitted during this period, who made a spontaneous recovery before E.C.T. was started.

The form used to reflect and record the data for each case, is printed below.

CASE

Age	Civil State
Family History of Mental Illness	(reflected in numerical terms)
Personal History of Conditioning Toward Maladjustment	(reflected in numerical terms)
Pre-Psychotic Personality With Abnormal Traits	(reflected in numerical terms)
European Influence Rating	(reflected in numerical terms)
Previous Mental Ill Health	(reflected in numerical terms)
Duration of Psychosis	(reflected in numerical terms)
Speed of Onset of Psychosis	(reflected in numerical terms)
Signs of Physical Ill Health on Admission	(reflected in numerical terms)
History of Possible Psychological Causative Factors	(reflected in numerical terms)

MENTAL STATE BEFORE AND AFTER TREATMENT
(Rated Numerically)

Rating Scale Items	Before E.C.T.	After 15	1 Week After	1 Month After
Behaviour				
Introversion				
Intellectual Disconnection				
Emotional Disconnection				
Conduct Disconnection				
Paranoid Disposition				
Type of Delusion				
Type of Hallucinations				
Ideas of Passivity/Influence				
Hypochondriasis				
Depression				
Elation				
Emotional Tension				

CLINICAL DIAGNOSIS

The apparatus used for treatment was an "Electric shock machine model P.S.-1" (Electro-Physical Laboratories, Inc., New York) and it delivered alternating current derived from a mains supply of 220 volts. A major fit was induced on two days per week until the total of 30 or 15 had been reached. The average voltage used was 100 to 130 and the average timing was ·4 of a second. Muscle relaxants were not given to these patients but premedication with atropin gr. 1/100 and paraldehyde dr. 2 'per os' was a routine.

Before setting out the results of E.C.T. in groups 2 and 3, the results of ordinary mental hospital care without E.C.T. in a group of schizophrenic Bantu women admitted to the Tower Hospital during 1943 will be given. As stated, those with a positive blood Wassermann, and those with appreciable physical disease on admission, were excluded from the group. In addition, all those who died within the first twelve months after admission were excluded, for it was assumed that probably they were in poor health on admission. This procedure was thought to be necessary because in the series of cases (groups 2 and 3) treated with E.C.T. ten years later, exclusion on physical grounds was based on consideration of the E.S.R., in addition to findings on simple physical examination. All data relating to this group of patients, naturally had to be collected from their office files only.

It was found that a total of 57 female schizophrenics, free from appreciable physical disease on admission, according to their records, and with negative blood Wassermanns, had been admitted during 1943, of these, 7 died during the first fifteen months, apparently mostly as a result of pulmonary tuberculosis, and this left a total of 50, from which group, cases were sorted with the aid of a Hollerith machine and cards, to match with cases from the two groups of patients similarly selected and treated with E.C.T. ten years later.

In Table I below are set out the 50 cases, together with their ages as stated on their admission documents (not absolutely reliable), the alleged duration of their psychoses and an estimate of the intensity of European influences to which they had been subjected, based upon knowledge of the area where they lived; a clinical diagnosis is given, and their condition (in terms of a rating scale score) fifteen months and ten years after admission.

The following are the simple rating scales which were used:

European Influence Rating Scale:

(a) *Area from whence:* Reserve: 0. Rural or Village: 1. Urban: 2.

(b) *Knowledge of English and Afrikaans:* Native only: 0. Unilingual: 1. Bilingual: 2. Maximum points obtainable: 4.

Behaviour Rating Scale:

1. Discharged "recovered": 9 points.
2. Discharged "improved" and working, and behaving well at the time: 8 points.
3. Discharged "on leave" and behaving and working well at the time: 7 points.
4. Still in hospital:
    (*a*) Well behaved: 3 points. Working well: 3 points.
    (*b*) Indifferently behaved: 2 points. Indifferent worker: 2 points.
    (*c*) Poorly behaved: 1 point. Poor worker: 1 point.
    (*d*) Very poorly behaved: 0 point. Not working: 0 point.

Behaviour was assessed from the routine monthly and three-monthly notes kept on record and with the rating scale of Rees in mind, e.g. "Indifferent behaviour" signified that the patient was not troublesome and her habits were correct but signs of abnormality were present.

"Poor behaviour" meant troublesome over- or under-activity.

"Very poor behaviour" meant very troublesome over- or under-activity.

Abbreviations Used in Tables:

Rec. = recovered.
Imp. = improved.
a.a. = after admission.
E.I.R. = European Influence Rating.
R.S.S. = Rating Scale Score.
S.S. = Simple Schizophrenia.
C.S. = Catatonic Schizophrenia.
P.S. = Paranoid Schizophrenia.
H.S. = Hebephrenic Schizophrenia.
U.S. = Unclassified Schizophrenia.
d=days; m=months; w=weeks; y=years.

From Table I it is evident that 7 of the group of 50 recovered spontaneously within fifteen months and that the average duration of stay in hospital for these recovered patients was 8·1 months. Only one of these patients (Case 49, No. 3664), subsequently relapsed and recovered twice during the ten years following her first admission. There is no evidence that any of the remaining six were re-admitted to any of the mental hospitals in the Union of South Africa during the ten-year period following their first admission; five of the seven were traced and found to be still maintaining their recovery ten years after admission.

TABLE I

Bantu Schizophrenics Not Treated Specifically
(Admitted in 1943)

Case	Number	Age	Psychosis Duration	E.I.R.	Diagnosis	R.S.S. 15 m. a.a.
1	FN. 2317	35	?	3	U.S.	1
2	FN. 2312	30	?	0	C.S.	1
3	FN. 2377	30	?	2	U.S.	0
4	FN. 2301	49	6 m.	0	C.S.	0
5	FN. 2356	30	2 w.	2	C.S.	1
6	FN. 2387	34	1 y.	1	U.S.	0
7	FN. 2370	35	?	3	C.S.	2
8	FN. 2328	50	4 d.	0	H.S.	0
9	FN. 2332	40	?	3	C.S.	0
10	FN. 2243	33	3 m.	0	P.S.	1
11	FN. 2285	20	7 m.	1	C.S.	1
12	FN. 2381	31	3 m.	0	C.S.	2
13	FN. 2376	24	?	3	C.S.	3
14	FN. 2351	40	3 m.	1	U.S.	3
15	FN. 2296	24	?	1	U.S.	0
16	FN. 2280	25	1 w.	2	H.S.	1
17	FN. 2225	30	?	3	C.S.	3
18	FN. 2306	36	?	3	C.S.	1
19	FN. 2234	38	?	3	U.S.	1
20	FN. 2246	28	2 y.	2	U.S.	0
21	FN. 2302	25	?	0	U.S.	3
22	FN. 2220	30	?	0	H.S.	4
23	FN. 2223	33	?	0	C.S.	0
24	FN. 2230	40	?	0	P.S.	1
25	FN. 2251	16	?	0	C.S.	0
26	FN. 692	25	6 w.	3	C.S.	3
27	FN. 693	35	?	1	H.S.	3
28	FN. 596	22	?	0	C.S.	3
29	FN. 731	31	?	0	U.S.	3
30	FN. 695	30	2 w.	3	C.S.	2
31	FN. 2276	50	?	2	C.S.	2
32	FN. 2265	57	?	3	C.S.	2
33	FN. 2826	55	?	2	U.S.	1
34	FN. 2257	30	?	2	C.S.	0
35	FN. 2285	20	3 y.	0	C.S.	0
36	FN. 2288	45	2 y.	1	C.S.	0
37	FN. 2289	25	4 y.	2	U.S.	1

TABLE I—*Continued*

Case	Number	Age	Psychosis Duration	E.I.R.	Diagnosis	R.S.S. 15 m. a.a.
38	FN. 2278	35	2 m.	2	C.S.	1
39	FN. 2331	20	?	3	C.S.	9 (Rec. 9 m. a.a.)
40	FN. 2345	22	3 d.	2	U.S.	9 (Rec. 8 m. a.a.)
41	FN. 2343	20	1 w.	3	H.S.	9 (Rec. 15 m. a.a.)
42	FN. 2378	30	2 w.	0	U.S.	9 (Rec. 3 m. a.a.)
43	FN. 2374	35	2 m.	3	P.S.	5
44	FN. 2295	24	1 m.	2	U.S.	5
45	FN. 2307	18	1 m.	1	U.S.	5
46	FN. 2359	25	4 d.	2	C.S.	9 (Rec. 3 m. a.a.)
47	FN. 2315	40	2 d.	3	C.S.	9 (Rec. 7 m. a.a.)
48	FN. 2316	32	?	2	C.S.	0
49	FN. 3664	29	1 m.	0	C.S.	9 (Rec. 2 m. a.a.)
50	FN. ?	22	?	1	H.S.	1
51	FN. 2321	35	1 w.	0	H.S.	Died 9 m. a.a.
52	FN. 2294	35	6 y.	1	C.S.	Died 11 m. a.a.
53	FN. 2339	45	7 m.	3	P.S.	Died 7 m. a.a.
54	FN. 2373	37	3 d.	1	U.S.	Died 6 m. a.a.
55	FN. 2365	42	?	1	U.S.	Died 8 m. a.a.
56	FN. 2363	36	4 y.	0	C.S.	Died 7 m. a.a.
57	FN. 2279	25	?	1	C.S.	Died 14 m. a.a.
Totals	—	1,533	760 w.	76	—	129
Means	—	30·6 y.	30 w.	1·52	—	2·58

ANALYSIS OF RESULTS

The following Tables reflect the results of E.C.T. in groups 2 and 3.

With reference to Tables II and III, it should be explained that modification of the simple scale used for group 1 (Table I) had to be introduced in rating cases one month after termination of E.C.T.; this was on account of the fact that no patient was discharged until 2 months after E.C.T. in order to ensure that sudden relapses did not take place at home; hence no patient was given a score of 9, and a score of 8 signified a complete recovery, and a score of 7 a nearly complete recovery. In other respects the rating was as for group 1, Table I. By "recovery" was meant, complete absence of symptoms in a patient who was working and behaving well, and by "nearly recovered" was meant, an almost complete absence of symptoms in a similar patient.

TABLE II

Female Bantu Schizophrenics treated with E.C.T. Groups 2 and 3 are combined; compare with Group 1, Table I, where the same simplified Rating Scale was used

Case	Number	Age	Psychosis Duration	E.I.R.	Diagnosis	Simplified R.S.S. 1 m. After E.C.T.	Simplified R.S.S. 15 m. a.a.
1	FN. 3777	34	6 m.	2	C.S.	1	2
2	FN. 3826	17	5 m.	2·5	P.S.	2	2
3	FN. 3823	30	?	0	P.S.	1	4
4	FN. 3840	50	2 y.	0	P.S.	2	8 (Imp.)
5	FN. 3852	20	18 m.	0·5	C.S.	1	1
6	FN. 3813	40	6 m.	1	P.S.	0	4
7	FN. 3856	25	?	2	C.S.	4	9 (Rec.)
8	FN. 3853	38	1 w.	3	C.S.	2	5
9	FN. 3782	50	3 y.	0	P.S.	3	2
10	FN. 3855	30	?	0·5	P.S.	8 (Rec.)	9 (Rec.)
11	FN. 3862	21	7 m.	0	U.S.	7 (G.I.)	9 (Rec.)
12	FN. 3863	40	6 m.	3	P.S.	4	9 (Rec.)
13	FN. 3870	25	1 m.	4	U.S.	5	9 (Rec.)
14	FN. 3868	40	1 m.	1·5	U.S.	1	1
15	FN. 3867	29	2 m.	1·5	C.S.	0	9 (Rec.)

TABLE II—*Continued*

Case	Number	Age	Psychosis Duration	E.I.R.	Diagnosis	Simplified R.S.S. 1 m. After E.C.T.	Simplified R.S.S. 15 m. a.a.
16	FN. 3865	27	3 m.	3·5	U.S.	3	7
17	FN. 3829	26	1 m.	0·5	C.S.	8 (Rec.)	9 (Rec.)
18	FN. 3871	47	3 w.	2·5	U.S.	4	4
19	FN. 3872	23	9 m.	1	C.S.	4	9 (Rec.)
20	FN. 3854	23	2 w.	2	C.S.	4	5
21	FN. 3879	30	4 d.	0·5	P.S.	8 (Rec.)	9 (Rec.)
22	FN. 3885	23	3 y.	1·5	S.S.	2	1
23	FN. 3709	31	1 y.	2·5	P.S.	1	0
24	FN. 3828	36	2 m.	0	C.S.	4	6
25	FN. 3877	40	4 d.	0	C.S.	2	2
26	FN. 3873	50	2 w.	0	U.S.	1	2
27	FN. 3892	32	6 m.	3·5	P.S.	8 (Rec.)	9 (Rec.)
28	FN. 3893	22	6 m.	3	C.S.	1	1
29	FN. 3898	25	5 d.	1	U.S.	1	2
30	3897	40	6 m.	1	U.S.	0	2
31	3895	30	7 m.	4	P.S.	7 (G.I.)	9 (Rec.)
32	3902	20	1 y.	1·5	S.S.	1	4
33	FN. 3911	25	2 m.	1	C.S.	3	6
34	FN. 3915	17	3 y.	0·5	C.S.	1	1
35	FN. 3933	30	?	0	U.S.	5	9 (Rec.)
36	FN. 3916	39	2 w.	1·5	C.S.	3	4
37	FN. 3919	29	3 d.	2·5	P.S.	8 (Rec,)	9 (Rec.)
38	FN. 3923	36	?	2	U.S.	2	1
39	FN. 3926	40	2 y.	0	C.S.	1	0
40	FN. 3931	18	5 d.	2·5	U.S.	3	8 (Disch. "I")
41	FN. 3936	32	5 y.	0	P.S.	2	8 (Disch. "I")
42	FN. 3963	35	3 d.	2	C.S.	0	2
43	FN. 3937	35	2 m.	1·5	U.S.	5	2
44	FN. 3940	40	?	1·5	U.S.	3	6
45	FN. 3939	26	15 m.	1	S.S.	4	5
46	FN. 3941	26	?	0·5	U.S.	0	2
47	FN. 3942	28	3 w.	1	U.S.	0	2
48	FN. 3946	30	2 m.	1·5	U.S.	6 (G.I.)	9 (Rec.)
49	FN. 3880	30	?	1	C.S.	3	2
50	FN. 3954	34	6 m.	0	C.S.	0	2
51	FN. 3949	40	1 w.	2	P.S.	2	4
52	FN. 3956	35	4 d.	1	C.S.	4	4
53	FN. 3957	40	3 m.	1·5	U.S.	8 (Rec.)	5
54	FN. 3958	30	2 m.	3	P.S.	1	7 (O.L.)
55	FN. 3955	18	2 y.	0	C.S.	4	7 (O.L.)
56	FN. 3960	35	1 y.	0	C.S.	2	4 (O.L.)
57	FN. 3961	25	?	0	H.S.	0	0
58	FN. 3962	36	?	1·5	U.S.	0	4
59	FN. 3930	21	2 d.	3	P.S.	(Rec. spontaneously)	
60	FN. 3969	39	4 m.	3	U.S.	4	6 (O.L.)
61	FN. 3947	40	2 m.	0	C.S.	0	0
62	FN. 3977	28	1 m.	0·5	C.S.	0	4
63	FA. 3983	23	6 y.	0·5	C.S.	1	1
64	FA. 3987	20	3 m.	0	U.S.	1	7 (O.L.)
65	FA. 3998	38	8 m.	1·5	C.S.	1	2
66	FA. 3990	24	4 m.	0	C.S.	0	0
67	FA. —	31	1 m.	0	P.S.	1	4
68	FA. 3999	44	2 d.	3	P.S.	4	2
69	FA. 4000	35	2 w.	1·5	C.S.	3	6 (O.L.)
70	FA. 4006	30	4 y.	2	C.S.	0	0
Totals (69 cases)		2,196	572 m.	93·5	N/A	185	309
Means (69 cases)		31·3	9·3 m.	1·3	N/A	2·67	4·47
Totals (45 cases of less than 1 year's duration)		1,452	120 m.	71·5	N/A	134	221
Means (45 cases of less than 1 year's duration)		32·2	2·6 m.	1·5	N/A	2·97	4·91

TABLE II—*Continued*

No E.C.T. Given

	Age	Psychosis Duration	E.I.R.	Diagnosis	Simplified R.S.S. 1 m. After E.C.T.	Simplified R.S.S. 15 m. a.a.
Totals (20 cases of less than 1 year's duration)	611	134 w.	30	N/A	N/A	84
Means (20 cases of less than 1 year's duration)	30	6·7 w.	1·5	N/A	N/A	4·2
All cases (50 Totals)	1,533	760 w.	76	N/A	N/A	129
All cases (Means)	30·6	30 w.	1·52	N/A	N/A	2·58

Comparing group 1 with groups 2 and 3 combined (Tables I and II), and considering all cases, it can be seen that of the 50 cases in group 1, 7 recovered within fifteen months of admission and that the average period these spent in hospital was 8·1 months. Of the 69 cases in groups 2 and 3 combined, 7 cases recovered within one month after E.C.T., and the average period spent in hospital by these patients, was 7 months. Considering only those cases who were alleged to have been abnormal for less than one year before admission, it is found that of 20 in group 1, 6 recovered within fifteen months of admission and that these spent an average period of 8 months in hospital, whereas of 45 cases in groups 2 and 3 combined, 6 recovered within one month of termination of E.C.T. and spent an average of seven months in hospital. (The 7th case relapsed before she could be discharged.)

From a comparison of the mean rating scale scores of these groups, it is also seen that the score of the treated groups one month after termination of E.C.T., was no better than the score of the untreated group, 15 months after admission.

As the groups (1 and "2 and 3 combined") are very similar, it may be concluded that no evidence was found to indicate that E.C.T. (one fit induced twice per week) gave better results than conservative methods. However, the matter was further investigated by the selection of two highly similar groups from groups 1, 2 and 3, by the method to be described.

With the aid of a Hollerith machine, it was possible to sort out 21 patients from groups 2 and 3 combined, who could be matched with 21 patients from group 1, as regards age, duration of psychosis and European influence rating. All patients were, of course, similar as regards sex, clinical diagnosis, and absence of appreciable physical abnormality. These two groups were named group 4 and group 5, respectively (see Table III), and were used to compare the results of E.C.T. with those of no specific treatment.

As it was assumed that only those who recovered within one month of termination of E.C.T., did so as a direct result of the treatment (x), the cases in group 4 were rated one month after termination of E.C.T. and the same simplified rating scale was used for these two groups, as in the case of group 1 (Table I), but with the slight modification mentioned.

With a critical ratio of less than 1, it cannot be said that there was a significant difference between the results of group 4 one month after E.C.T., and the results of conservative institutional care in group 5, 15 months after admission; what advantage there was lay with the latter group.

Moreover, those who recovered in the untreated group were discharged within an average period of 6·2 months, whereas in group 4 the two who recovered did not leave hospital in less than 5 months. It cannot therefore be said that E.C.T., in the way given, appreciably hastened the discharge of patients in group 4, as compared with those on conservative treatment in group 5. With courses of 30 fits given at the rate of two fits per week, E.C.T. may actually delay the discharge of patients who recover spontaneously during the course.

On the whole therefore, it may be again concluded, that E.C.T. (one fit induced twice per week until 15 or 30 had been given) has not been shown definitely to produce better results than the conservative hospital treatment of ten years before. Valuable, though short-lived immediate effects of E.C.T. are of course not being taken into account when making this statement.

TABLE III

E.C.T. compared with Conservative Treatment. Matched Groups Used

Case	Group 4 (E.C.T.)	Case	Group 5 (No E.C.T.)
	Simplified R.S.S. 1 m. After E.C.T.		Simplified R.S.S. 15 m. a.a.
34	1	35	0
2	2	11	1
66	0	49	9
48	6	44	5
62	0	42	9
37	8	46	9
22	2	37	1
54	1	30	2
28	1	26	3
67	1	10	1
53	8	12	2
30	0	6	0
69	3	16	1
1	1	38	1
65	1	14	3
8	2	43	5
60	4	47	9
26	1	8	0
4	2	4	0
9	3	36	0
64	1	45	5
	Total Cases=21 Total Score=48 Mean Score (m.1)=2·3 S.D. (σ1)=$\sqrt{5\cdot34}$		Total Cases=21 Total Score=66 Mean Score (m.2)=3·1 S.D. (σ2)=$\sqrt{10\cdot45}$

$$\text{C.R.} = \frac{\text{m1} - \text{m2}}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} = \cdot 94$$

The figures in Tables IV and V suggest that E.C.T. improved the conduct of the group as a whole, but that 15 E.C.T.s had a better immediate effect than 30, and that the score one month after 30 E.C.T.s was hardly better than the score immediately after 15. It may be concluded from this that 30 E.C.T.s given bi-weekly have not been shown to have a better effect than 15, given

TABLE IV

E.C.T. given Bi-weekly to Group 2 until a Total of 30 Major Fits had been Induced

Case	R.S.S. (Rees) Before E.C.T.	R.S.S. (Rees) After 15th E.C.T.	R.S.S. (Rees) 1 Week After 30th E.C.T.	R.S.S. (Rees) 1 Month After 30th E.C.T.	Simplified R.S.S. 15 Months After Admission
1	44	35	17	34	2
2	30	28	31	32	2
3	32	31	32	29	4
4	22	30	51	40	8
5	41	40	44	38	1
6	34	30	26	30	4
7	43	40	32	15	9
8	24	10	49	16	5
9	22	20	17	22	2
10	14	13	51	7	9
11	36	10	9	5	9
12	32	28	25	10	9
13	40	19	4	4	9
14	37	28	33	19	1
15	53	8	51	52	9
16	30	22	50	3	7
17	51	14	0	0	9
18	22	35	22	4	4
19	37	14	33	26	9
20	48	21	32	8	5
21	33	8	0	0	9
22	40	32	31	37	1
23	26	13	24	21	0
24	47	26	29	26	6
25	33	33	41	28	2
26	21	19	12	15	2
27	15	16	5	0	9
28	17	10	23	20	1
29	33	12	9	26	2
Totals	958	645	784	566	149
Means	33·0	22·2	27·0	19·5	5

bi-weekly. Nor do the mean scores fifteen months after admission indicate that such benefits as resulted were better maintained in the group treated with the longer of the two courses; the critical ratio in this respect (less than 1) is not significant either.

TABLE V

E.C.T. given Bi-weekly to Group 3 until a Total of 15 Fits had been Induced

Case	R.S.S. (Rees) Before E.C.T.	R.S.S. (Rees) 1 Week After 15th E.C.T.	R.S.S. (Rees) 1 Month After 15th E.C.T.	Simplified R.S.S. 15 Months After Admission
30	16	17	19	2
31	9	3	0	9
32	35	21	19	4
33	41	4	32	6
34	39	36	26	1
35	25	24	4	9
36	27	28	26	4
37	30	10	4	9

TABLE V—*Continued*

Case	R.S.S. (Rees) Before E.C.T.	R.S.S. (Rees) 1 Week After 15th E.C.T.	R.S.S. (Rees) 1 Month After 15th E.C.T.	Simplified R.S.S. 15 months After Admission
38	16	21	22	1
39	40	40	22	0
40	24	24	14	8
41	19	24	19	8
42	32	31	31	2
43	30	14	4	2
44	20	11	12	6
45	22	29	9	5
46	31	35	38	2
47	32	34	36	2
48	23	3	1	9
49	37	36	39	2
50	40	37	36	2
51	19	15	31	4
52	29	0	10	4
53	22	0	0	5
54	27	17	13	7
55	37	4	1	7
56	36	12	22	4
57	25	27	38	0
58	23	26	25	4
59	No E.C.T. given—Spontaneous recovery			
60	17	10	5	6
61	43	17	38	0
62	40	36	37	4
63	40	26	30	1
64	35	34	27	7
65	39	27	31	2
66	40	22	19	0
67	26	28	27	4
68	20	34	22	2
69	34	26	21	6
70	41	38	42	0
Totals	1,197	881	852	160
Means	24·5	21·5	20·8	4·0

As in the case of group 2, group 3 shows a better score one month after termination of treatment than one week after it, but here the difference is less marked.

Taking, from groups 2 and 3, only those cases with a psychosis of duration less than one year before admission, it is found that their mean, age, etc., are as follows:

Means	Group 1a (21 Cases) 30 E.C.T.s	Group 2a (24 Cases) 15 E.C.T.s
Age	31·6 years	32·8 years
Duration of psychosis	3·0 months	2·3 months
E.I.R.	1·7	1·4
R.S.S. (Rees) before admission	34·1	29·0
R.S.S. (Rees) 1 week after E.C.T.	23·8	19·6
R.S.S. (Rees) 1 month after E.C.T.	17·0	20·1
R.S.S. (Simplified) 15 months after admission	5·42	4·41

TABLE VI

Comparison of Cases Treated with 30 and 15 E.C.T.s Respectively. Matched Groups Used

Group 6 (30 E.C.T.s)

Case	Rees Behaviour Treatment	Rating 1 Week After Treatment	Scale 1 Month After Treatment	Simple R.S.S. 1 Month After Treatment	Simplified R.S.S. 15 Months After Admission
5 ..	41	44	38	1	1
2 ..	30	31	32	2	2
11 ..	36	9	5	7	9
21 ..	33	0	0	8	9
19 ..	37	33	26	8	9
22 ..	40	31	37	2	1
28 ..	17	23	20	1	1
25 ..	33	41	28	2	2
24 ..	47	29	26	4	6
14 ..	37	33	19	1	1
6 ..	34	26	30	0	4
1 ..	44	17	34	1	1
8 ..	24	49	16	2	5
18 ..	22	22	4	4	4
(14 cases) Totals ..	475	388	315	43	55
Means ..	33·8	27·7	22·5	3·0	3·9
S.D. ..	—	—	—	$\sqrt{\frac{97}{14}}$	—
C.R. ..	—	—	—	1·52	—

Group 7 (15 E.C.T.s)

Case	Rees Behaviour Treatment	Rating 1 Week After Treatment	Scale 1 Month After Treatment	Simple R.S.S. 1 Month After Treatment	Simplified R.S.S. 15 Months After Admission
34 ..	39	36	26	1	1
40 ..	24	24	14	3	8
66 ..	40	22	19	0	0
33 ..	41	4	32	3	6
45 ..	22	29	9	4	5
63 ..	40	26	30	1	1
54 ..	27	17	13	1	7
67 ..	26	28	27	1	4
61 ..	43	17	38	0	0
52 ..	29	0	10	4	4
30 ..	16	17	19	0	2
65 ..	39	27	31	1	2
60 ..	17	10	5	4	6
51 ..	19	15	31	2	4
(14 cases) Totals ..	422	272	304	25	50
Means ..	30·1	19·4	21·7	1·78	3·6
S.D. ..	—	—	—	$\sqrt{\frac{30}{14}}$	
C.R. ..	—	—	—	1·52	—

One month after termination of treatment, 4 of the 21 in group 1(a) were fit for discharge as compared with 2 of the 24 in group 2(a). From the above data it can be seen that the two groups were very similar and that one month after treatment the group treated with 30 E.C.T.s had an advantage in the number of cases fit for discharge, but not a significant advantage in the rating scale scores. The advantage may however merely be apparent, and due to the fact that group 1 cases had two months longer in which to recover, their course of treatment having lasted for four, and not for two months, as in the case of group 2. Moreover one (21), of the four cases, was symptom free after the seventh, and one (17) after the 15th E.C.T.; a third (19) was very much improved after the 15th E.C.T. Only Case 27 first recovered within one month of the 30th E.C.T., so that there is little to suggest that the course of 30 E.C.T.s was responsible for the advantage in recoveries shown by group 1 as compared with group 2.

To aid in deciding if 30 E.C.T.s are more effective than 15, in the treatment of schizophrenia, two groups (6 and 7) were matched with the aid of a Hollerith machine. Group 6 was selected from the patients in group 2 and group 7 from those in group 3. They were matched for age, duration of psychosis, European influence rating, behaviour rating scale score (Rees), introversion, disconnection (emotional, intellectual and conduct), paranoid disposition and affective disturbance (depression, elation, emotional tension), being a modified item sheet similar to the one used by Rees.

They were rated for improvement, by using the Rees behaviour rating scale, as well as the same simplified rating scale referred to in Table II, one week and one month after treatment.

The figures in Table VI will indicate that there was little difference between the scores of the two groups before treatment, and one month after treatment, on the Rees scale. Group 6 had a score indicating more abnormality than group 7, one week after treatment, and this was probably due to the greater number of fits induced in the former group, as many convulsions are known to cause some confusion, a state of euphoria, and memory disturbances which are all transitory. Using the simple rating scale, there is a critical ratio of only 1·5, hence it cannot be said that the difference in results between these two groups was significant, and it may not be concluded that a longer course was shown to be better than a shorter course of E.C.T. in schizophrenia.

TABLE VII

Alteration of Symptoms After E.C.T. in Bantu Schizophrenics

Symptomatology	Number of Cases	Rating Before E.C.T.		1 Week After E.C.T.		1 Month After E.C.T.	
		Total	Mean	Total	Mean	Total	Mean
Introversion	60	203	3·3	155	2·5	153	2·5
Intellectual Disconnection ..	51	149	2·9	114	2·2	95	1·8
Emotional Disconnection ..	60	164	2·7	128	2·1	133	2·2
Conduct Disconnection ..	55	134	2·4	99	1·8	104	1·9
Paranoid Disposition ..	40	82	2·0	50	1·2	46	1·1
Depression	10	11	1·1	6	0·6	1	0·1
Elation	8	11	1·3	3	0·3	0	0·0
Emotional Tension ..	18	21	1·1	12	0·6	9	0·4

Only cases who were rated on all three occasions, and only those who scored at least 1 at the first rating, are reflected in Table VII.

The figures indicate that on the whole mild degrees of depression or of elation, present in a few cases, were dispelled after E.C.T.; and this was more evident one month after termination than one week after. Emotional tension was likewise, but not as completely, relieved.

Introversion was alleviated after E.C.T. in so far as a "moderate" rating for the group as a whole was converted into a "mild". It is noteworthy that there was no appreciable difference one week and one month after termination.

A "mild" paranoid disposition rating for the group as a whole was converted into a "very mild", one week and one month after E.C.T.

Intellectual, emotional, and conduct disconnection were improved somewhat after E.C.T., but hardly significantly so. (C.R. not calculated.)

The figures in Table VII suggest that only symptoms of affective disorder were significantly improved after E.C.T., but paranoid disposition symptoms also seemed to diminish. There is no suggestion that improvement in any other respect was due to the E.C.T., and as no control group was used, no definite conclusions could be reached.

TABLE VIII

The Onset of Improvement during E.C.T. of Bantu Schizophrenics

Time During E.C.T. Treatment At Which Improvement First Appeared	All Cases (Groups 2 and 3)			Recovered or Greatly Improved Within 1 Month of Termination		
	Group 2	Group 3	Total	Group 2	Group 3	Total
After 1st	0	2	2	0	1	1
After 2nd	1	3	4	0	0	0
After 3rd	3	0	3	0	0	0
After 4th	0	3	3	0	0	0
After 5th	0	2	2	0	1	1
After 6th	1	4	5	0	0	0
After 7th	1	0	1	1	0	1
After 8th	1	0	1	1	0	1
After 9th	0	2	2	0	0	0
After 10th	0	1	1	0	1	1
After 11th	0	0	0	0	0	0
After 12th	0	0	0	0	0	0
After 13th	0	0	0	0	0	0
After 14th	0	0	0	0	0	0
After 15th	2	4	6	2	1	3
After 16th–30th	6	0	6	2	0	2
No improvement at any stage	14	19	33	N/A	N/A	N/A
Totals	29	40	69	6	4	10

The figures in Table VIII do not indicate clearly that failure to respond early to E.C.T. is a sign of poor prognosis. However, improvement, if it occurs, seems to take place earlier during the course of E.C.T. more often than later.

From a comparison of the ten cases which were recovered or greatly improved one month after E.C.T., with the ten patients who were least affected by the treatment, certain conclusions may be drawn. (Refer Tables IX and X.)

The average duration of psychosis in the unimproved group is much greater than in the improved and recovered group, and the degrees of introversion and of disconnection were also greater in the case of the former group.

TABLE IX

Cases which Recovered or Improved Greatly within One Month of Termination of E.C.T.

Case	Age	Duration	E.I.R.	Introversion	Disconnection	Restlessness	Paranoid Disposition	Affective Disturbance
10	30	?	0·5	2	3	4	3	2
11	21	7 m.	0·0	4	4	4	2	2
17	26	1 m.	0·5	4	3	5	0	2
19	23	9 m.	1·0	3	3	4	1	2
21	30	4 d.	0·5	3	3	0	3	0
27	32	6 m.	3·5	3	1	1	1	0
31	30	7 m.	4·0	2	1	0	2	0
37	29	3 d.	2·5	4	2	0	3	2
48	30	2 m.	1·5	3	2	0	1	1
53	40	3 m.	1·5	4	2	0	2	1
10 cases	291	—35 m.	15·5	32	24	18	18	10
Means	29·1	—3·5 m.	1·5	3·2	2·4	1·8	1·8	1·0

TABLE X

Cases which were the Least Influenced by E.C.T. (Group 9)

Case	Age	Duration	E.I.R.	Introversion	Disconnection	Restlessness	Paranoid Disposition	Affective Disturbance
4	50	2 y.	0	5	4	3	4	2
5	20	18 m.	0·5	3	3	0	0	0
22	23	3 y.	1·5	4	2	0	0	0
46	26	?	0·5	4	3	0	0	0
47	28	3 w.	1	4	3	0	0	1
50	34	6 m.	0	4	4	0	0	1
49	30	?	1	4	3	0	0	0
57	25	?	0	5	3	1	0	0
62	28	1 m.	0·5	3	4	3	0	2
70	30	4 y.	2	4	3	3	1	0
10 cases	294	11 y.	7·0	40	32	10	5	6
Means	29·4	1·3 y.	0·7	4	3·2	1	0·5	0·6

The number of cases with paranoid disposition was 9 in the improved as compared with 2 in the unimproved group.

Restlessness, European influence rating and affective disturbance, were all greater in the improved group than in the unimproved group. It may therefore be concluded that the following factors signify a poor prognosis: Duration of one year or more, high introversion rating, high disconnection rating, absence of restlessness, absence of paranoid disposition, low affective disturbance rating (agitation, elation, depression). The following, it may be concluded, are of good prognostic significance: Duration of less than 4 months, restlessness, paranoid disposition, affective disturbance (apprehension, elation or depression).

SUMMARY AND CONCLUSIONS

1. The symptomatology of schizophrenia in Africans has not been shown to differ clearly or fundamentally from that in Europeans. The possibility of a significant difference in prognosis is discussed and the factors which may influence this are reviewed, as well as the published results of insulin shock and convulsion therapy in the schizophrenia of Europeans.

2. A common method of E.C.T. is evaluated in 69 schizophrenic Bantu women using a group of 50 as controls. An item sheet and rating scales are employed and the results subjected to statistical verification.

3. The result of this investigation should not suggest that more intensive E.C.T., over a shorter period, is not worth a trial, or that valuable short-term benefits are not obtained with E.C.T., in Bantu schizophrenics.

4. E.C.T. as outlined did not produce appreciably better results one month after termination of treatment than conservative methods, fifteen months after admission (refer Tables II and III). Treatment consisting of 30 convulsions given at the rate of two per week, may actually delay the discharge of patients who recover spontaneously. Nor has it been shown that a course of 30 convulsions at the rate of 2 per week benefits more than one of 15 only, given at the same rate (refer Table VI).

5. Spontaneous recoveries in a group of 50 female Bantu schizophrenics of all ages, types and duration, amounted to 14 per cent., but in 20 of less than a year's duration, to 30 per cent., fifteen months after admission.

Muller (35) concluded that the rate of spontaneous recovery (in Europeans) was probably 15 to 20 per cent. in cases of all types and duration, and Mayer-Gross (26) reported a rate of 34·5 per cent. in cases of less than one year's duration.

6. Recoveries within one month of E.C.T. in a group of 69 female Bantu schizophrenics of all ages, types and duration, amounted to 10 per cent., but in 45 of less than a year's duration to 13 per cent.; 15 months after admission these percentages had risen to 20 per cent. and 24 per cent. respectively.

Cook (34) concluded from his review that the results of convulsion treatment in schizophrenia (of Europeans) probably amounted to a recovery rate of 55 to 60 per cent., but Rees (25) reported only 38 per cent. recoveries in cases of less than one year's duration, and Ross and Malzburg, quoted by Cook (34), reported only 11·5 per cent. of recoveries with convulsion therapy.

7. The recovery rate in schizophrenia of Europeans and Africans, with and without E.C.T., probably does not differ appreciably, even though from the present investigation it seems as if the prognosis in the Bantu is poorer. Features indicating a good or bad prognosis are similar for Europeans and Africans.

8. Of poor prognostic significance were found to be: (*a*) Duration of psychosis of more than one year. (*b*) Marked introversion and disconnection. (*c*) Absence of restlessness. (*d*) Absence of paranoid disposition. (*e*) Absence of tension, elation and depression.

9. Of favourable prognostic significance were found to be: (*a*) Duration of psychosis of less than four months. (*b*) Restlessness. (*c*) Paranoid disposition. (*d*) Elation, depression and emotional tension.

10. No evidence was found which indicated clearly that failure to respond early to E.C.T. is a sign of poor prognosis in schizophrenia.

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PATTERNS OF COGNITIVE TEST PERFORMANCE AS FUNCTIONS OF THE LATERAL LOCALIZATION OF CEREBRAL ABNORMALITIES IN THE TEMPORAL LOBE

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THE PROBLEM

VARIOUS investigations into the effects of brain injury on psychological test performance (Weisenburg and McBride, 1935; Patterson and Zangwill, 1944; Anderson, 1951; McFie and Piercy, 1952; Bauer and Becka, 1954; Milner, 1954) suggest the overall conclusion that patients with left hemisphere lesions are relatively poor at verbal tasks, while those with right-sided lesions do worst at practical tasks, particularly the manipulation of spatial or spatio-temporal relationships. Heilbrun's (1956) study confirmed that verbal deficits result from left-sided lesions but his left and right hemisphere groups produced almost identical scores on spatial tests. In so far as these workers paid attention to the specific sites of the lesions, their findings indicate that the pattern of test performance is a function of the hemisphere in which the lesion occurs rather than of its specific locus.

It would be expected, on the basis of these studies, that patients with lesions of specific locus, but unselected in terms of the laterality of the lesions, would show, as a group, no differential pattern of verbal/non-verbal scores. The verbal deficits of those patients with left-sided lesions would be counter-balanced by the non-verbal deficits of those with right-sided lesions. A number of reports on the effect of lesions of the temporal lobe, however, appear to be inconsistent with the above. These studies indicate that samples of cases with temporal lobe lesions, without reference to laterality, manifest a differential pattern of verbal/non-verbal scores.

The aim of the present study is to investigate further the cognitive effects of temporal lobe lesions and to attempt to explain the apparent contradiction between the two groups of findings described above.

THE EFFECTS OF TEMPORAL LOBE LESIONS

Rey *et al.* (1949) investigated patients exhibiting electroencephalographic abnormalities of the temporal lobes. These were classified as "constitutional" or "epileptic". The former consisted of slow wave dysrhythmia in the "theta" range without spike or paroxysmal features; the latter included epileptic foci or paroxysmal features and sharp waves. Intelligence test results indicated that the "constitutional" group tended to score higher on verbal than on non-verbal or performance tests, whereas, for the "epileptic" group, the reverse was true.

Foulds, as cited by Jones (1953), suggests, from clinical data, a relationship between the latter type of cognitive test pattern and focal EEG abnormalities in the temporal and parietal lobes of epileptic patients. Meyer and Yates (1955) report a similar but statistically insignificant trend for their group of patients with temporal lobe epilepsy. Quadfasel and Pruyser (1955) compared patients with psychomotor seizures and anterior temporal spike foci with patients exhibiting "grand mal" seizures and generalized EEG abnormalities. Cognitive tests gave no indication that the "grand mal" group differed from normal controls, but the "psychomotor" group exhibited significant impairment in tests of verbal intelligence and memory for verbal material. Jayasundera (1954) compared the EEG findings for patients with "non-verbal" scores reliably higher than their "verbal" scores, with those for patients without such a discrepancy. Contrary to expectation based on the findings of Rey *et al.* (1949), a significantly high incidence of the "constitutional" type of EEG abnormality was found in the former group. It should be noted, however, that Jayasundera's subjects were psychiatric patients exhibiting no clinical signs of neurological disorder, and his experimental design involved a reversal of the independent and dependent variables in the other studies quoted.

None of these investigations into the effects of temporal lobe lesions included a statistical analysis of results in terms of lateralization. Milner (1954) carried out such an analysis, but unfortunately did not consider verbal deficit. She found that patients with right temporal lesions were inferior to those with left-sided lesions in visual and tactile tests of spatial patterning. These differences were accentuated after temporal lobectomy.

Hypotheses to be Investigated

A possible explanation of the discrepant findings is that epileptic foci tend to occur more frequently in the left than the right temporal lobe. Rey *et al.* (1949) found this in a sample of 59 cases and quote other evidence in support of this view. Hécaen and Piercy (1956) examined 414 cases and report that epileptic aurae and equivalents are significantly more frequent with left-sided foci. A complicating factor arises from Rey *et al.*'s finding that, within their "epileptic" group, right side involvement was significantly more frequent in males than females.

Thus the verbal performance pattern in groups of patients with temporal lobe lesions may largely depend on the composition of the groups. An unselected sample would be expected to contain a preponderance of left-sided foci and, therefore, to exhibit a "verbal" deficit. In accordance with this view, Meyer and Yates, whose sample included a higher proportion of non-dominant cases than did that of Quadfasel and Pruyser, found an insignificant trend in the predicted direction whereas, in the latter study, this trend achieved significance. Similarly, the "performance" deficit in Rey *et al.*'s "constitutional" group is in line with the preponderance of right-sided abnormalities within that group. It is possible that Jayasundera's discrepant findings result from a high incidence of left-sided abnormalities, but no information on this point is available.

On the basis of this argument the present investigation is concerned with the testing of the following hypotheses on groups of patients with temporal lobe focal epilepsy:

1. The total sample will contain a preponderance of left-sided abnormalities and will tend to score lower on verbal than on non-verbal tests. This trend may not achieve statistical significance for this relatively small sample.

2. "Dominant" cases, as a group, will exhibit a larger and significant trend towards such a verbal deficit.

3. "Non-dominant" cases, as a group, will tend to score lower on non-verbal than on verbal tests.

As the patients studied all submitted to temporal lobectomy and were tested before and after the operation, the effect of the operation must also be considered. It has been suggested by Hebb (1945) and Milner (1954) that diseased cerebral tissue may be more productive of symptoms than mere absence of tissue, but this view is based on investigations involving patients with macroscopic cerebral lesions and exhibiting obvious clinical and neurological signs which subsided post-operatively (Roberts, 1951; Fox and German, 1935; Nielsen, 1939; Hebb, 1939; Kreuger *et al.*, 1954). Examination of the present series of patients (Falconer, 1953; Falconer *et al.*, 1955; Meyer *et al.*, 1954) failed to reveal space-occupying or other gross circumscribed lesions. All, however, displayed unilateral, or predominantly unilateral, localized EEG foci, and pathological studies of the excised specimens revealed mainly microscopic changes in most instances. Before the operation no obvious permanent neurological signs were evident, but post-operatively most patients developed partial homonymous hemianopia, usually limited to the upper quadrants and most patients with left-sided lesions manifested some degree of persistent nominal dysphasia. Some patients also suffered from diplopia and ptosis. Later, however, these disabilities subsided. As the EEG abnormalities subsided in most cases these abnormalities are presumably due to structural damage (scars, oedema) caused surgically.

The speech disturbances exhibited by the "left-side" cases would be expected to enhance the verbal deficit. Kennedy and Wolfe (1936) however, have pointed out that dysphasia may also impair performance on non-verbal tests, since most of these involve verbal instructions. Furthermore, the solution of non-verbal problems may involve intervening thought processes of a verbal nature. The effect on non-verbal scores is likely to be less marked, however, than that on verbal scores, in accordance with evidence quoted by Milner (1954).

The post-operative visual defects might be expected to lower "performance" scores but evidence presented by Milner (1954), Batters by *et al.* (1955), Battersby *et al.* (1956) and Elithorn (1955), indicates that such sensory defects do not have this effect. On the other hand, observation of the present series of patients during early post-operative testing suggested some disturbance in relation to non-verbal tests, particularly if speeded, until the patients adapted to their visual defects.

Evidence from Milner's (1954) study indicates that non-dominant temporal lobectomy increases deficits in relation to spatial patterning independently of sensory defects. Meyer and Yates' (1955) data do not support this finding but were derived from a very small sample.

In view of this multiplicity of effects no firm or precise predictions can be made as to the effects of the operation on the verbal/performance pattern. The basic predicted patterns are, however, expected to persist and, if anything, increased discrepancies may be expected.

The Experimental Sample

The 31 patients of this series are described briefly in Table I. No detailed description is necessary as this has been done elsewhere (Hill, 1953; Falconer, 1953, 1954), and one study (Falconer *et al.*, 1955) which includes some 50 per cent. of the present patients, is reported with a full discussion of the selection

TABLE I

Description of Patients

"Dominant" Cases

No.	Sex	Age in Years	Duration of Fits in Years	EEG Evidence
1	M	46	15	L.T.
2	M	42	4	L.T.
3	M	39	31	L.T.
4	M	35	13	L.T.
5	M	32	15	L.T.
6	M	27	14	L.T.
7	M	17	15	L.T.
8	M	31	29	L.T.
9	F	34	18	L.T.
10	F	22	20	L.T.
11	F	20	7	L.T.
12	F	18	14	L.T.
13	M	12	9	L.T. (+R.T.)
14	M	13	2	L.T. (+R.T.)
15	M	23	12	L.T. (+R.T.)
16	F	43	12	L.T. (+R.T.)
17	F	38	30	L.T. (+R.T.)
18	F	25	14	L.T. (+R.T.)
19	F	20	6	L.T. (+R.T.)
20	F	17	9	L.T. (+R.T.)
	Mean	27·70	14·45	
	S.D.	10·50	8·07	

"Non-Dominant" Cases

No.	Sex	Age in Years	Duration of Fits in Years	EEG Evidence
21	M	45	43	R.T.
22	M	29	14	R.T. (+R.F.)
23	M	23	21	R.T.
24	F	28	6	R.T. (+R.H.)
25	F	27	12	R.T.
26	F	21	19	R.T.
27	F	17	10	R.T.
28	F	15	7	R.T.
29	F	19	7	R.T. (+L.T.)
30	M	45	27	R.T. (+L.T.)
31	M	19	13	R.T. (+L.T.)
	Mean	26·18	16·27	
	S.D.	10·34	11·00	

R.T.	Right temporal focus.
L.T.	Left temporal focus.
R.T. (+L.T.)	Bilateral temporal focus with right focus predominant.
R.H.	Right hemisphere focus.
R.F.	Right frontal focus.

of patients, the surgical techniques, the pathological findings and the therapeutic and incidental effects of the operation.

These patients were selected for temporal lobectomy upon evidence, first clinical then electroencephalographic, that an epileptic focus existed in the anterior part of one temporal lobe or, if bilateral, predominantly on one side, and that the seizures failed to respond to adequate anticonvulsant therapy.

For the purposes of the study the patients are divided into "dominant" and "non-dominant" groups. The notion that aphasia results from a lesion of the dominant hemisphere as indicated by contralateral handedness has been well established for clear-cut right-handers but the work of Humphrey and Zangwill (1952), Goodglass and Quadfasel (1954), Roberts (1955) and Hécaen and Piercy (1956) indicates that the application of this rule to left-handers is inappropriate. Left-handers manifest dysphasia as frequently after left hemisphere lesions as after right-sided lesions; they become dysphasic following unilateral lesions more frequently than do right-handers, but their dysphasia is more transient. Thus left-handedness may imply lack of completely developed dominance or specialization of one hemisphere for language functions. For this reason all unequivocal right-handers with left-side operations are classed as "dominant", while right-handers with right-side operations are described as "non-dominant". All left-handed and ambidexterous cases have been excluded.

The patients with bilateral EEG foci have been included as it was considered that the marked predominance of one focus should determine the nature of the cognitive deficits, although the magnitudes of test discrepancies might be lower than those for strictly unilateral foci. The preponderance of left-sided abnormalities is in agreement with Rey *et al.*'s findings but, unlike their series, distribution of male and female patients within each group is equal.

As may be seen from Table IV, the two groups do not differ significantly in respect of such variables as the Wechsler Full Scale I.Q., age at the time of examination, age of onset, and durations of seizures. The same applies to the male and female patients within each group but the differing age-ranges and unequal numbers within these groups tend to invalidate the usual "t" test in respect of age. Data to be presented later, however, indicate that the test discrepancy scores are not significantly related to age. The mean original Wechsler Full Scale I.Q. for the total group is 97·71 (range 67–126), a value comparable with that for a sample of the general population and in agreement with recent findings concerning non-institutional epileptics (Collins, 1951; Falsom, 1953). This figure is almost identical with that found by Meyer and Yates (1955) for a similar but smaller sample.

Prior to their operations most patients received anticonvulsant drug therapy. The following drugs were administered singly or in some combinations: Phenobarbitone ($\leq 1\frac{1}{2}$ gr./day); Phenytoin (6–9 gr./day); Primidone ($\leq 1\cdot5$ gm./day); Amphetamine (10–15 mg./day). Post-operationally similar drugs were administered but in greatly reduced dosages in the majority of cases. The available evidence as summarized by Jones (1953) suggests that some anticonvulsant drugs in such dosages have no deleterious effects on cognitive functioning. If such effects do occur, the post-operative reduction in dosage would be expected to result in intellectual improvement.

The Tests

During routine psychological testing and research into intellectual changes following temporal lobectomy the Wechsler-Bellevue Intelligence Scale (Wechsler, 1944), the Mill Hill Vocabulary Test (Raven, 1938a) and the Progressive Matrices (Raven, 1938b) were administered to these patients. Form I of the Wechsler Scale and Form I of the Mill Hill Vocabulary test were used pre-operatively, and Form II (Wechsler, 1946) and Form II Mill Hill, respectively, after the operation. Owing to lack of an equivalent form of the test, the same Matrices were used on each occasion. Pre-operative testing occurred from one to fourteen days prior to the operation in 90 per cent. of the cases; for a similar percentage the re-assessments were made from 21 to 30 days after the operation. The "Information" subtest of the Wechsler Scale was omitted, being unsuitable for English subjects.

The aptness of these tests for the present study is ensured by the fact that the original contradiction in findings emerged from studies making use of these tests. The Mill Hill test and the Wechsler Verbal Scales are verbal tests, while the Wechsler Performance Scale and the Matrices are non-verbal tests. All measure "general intellectual ability" and various more specialized abilities. Practice gains in test scores are negligible for the Wechsler Scale when Form I is followed by Form II (Gerboth, 1950): the same is true for retests on vocabulary tests (Yates, 1956). Mean retest gains of from two to four raw score points are expected with the Matrices (Eysenck, 1944; Desai, 1952).

Results

All test scores are shown in Tables II and III.

TABLE II

Results with Wechsler Intelligence Scale

Dominant Cases	Verbal Scale I.Q.		Performance Scale I.Q.		Full Scale I.Q.	
	Pre-operation	Post-operation	Pre-operation	Post-operation	Pre-operation	Post-operation
1	93	63	98	91	94	74
2	107	96	123	104	116	101
3	102	95	121	108	112	100
4	122	120	124	125	125	124
5	104	102	124	117	115	110
6	83	72	77	81	79	76
7	108	95	115	96	113	93
8	86	82	74	84	79	82
9	98	84	108	97	104	89
10	69	74	72	67	67	68
11	96	84	104	97	100	89
12	77	76	101	77	87	77
13	82	87	94	98	86	93
14	80	61	77	77	77	66
15	96	81	102	92	99	85
16	104	104	99	102	101	103
17	90	69	105	84	98	75
18	101	69	81	56	91	60
19	77	70	84	63	79	64
20	99	94	94	98	96	96
Means ..	93·70	83·90	98·85	90·70	95·90	86·25
S.D.s ..	13·09	15·31	17·23	17·44	15·46	16·69
Non-dominant Cases						
21	99	91	105	104	102	96
22	131	129	117	106	126	120
23	87	87	100	96	93	91
24	123	130	108	113	117	124
25	113	113	126	116	120	115
26	106	118	114	122	111	122
27	86	85	78	85	80	85
28	87	93	74	87	79	89
29	105	118	99	92	103	107
30	108	109	115	107	112	106
31	80	71	63	58	68	61
Means ..	102·27	104·00	99·91	98·73	101·00	101·45
S.D.s ..	16·32	19·57	20·01	17·97	18·83	19·26
Means for Total Group	96·74	91·03	99·23	93·55	97·71	91·64
S.D.s ..	14·65	19·28	17·94	17·76	16·61	18·83

TABLE III

Results with Mill Hill and Matrices Tests

Dominant Cases	Mill-Hill Test				Matrices Test			
	Pre-operation		Post-operation		Pre-operation		Post-operation	
	I.Q.	Raw Score	I.Q.	Raw Score	I.Q.	Raw Score	I.Q.	Raw Score
1	86	43	77	30	90	25	89	23
2	90	48	81	35	118	46	119	47
3	87	44	89	47	109	42	109	42
4	98	56	95	53	126+	54	124	52
5	89	47	86	45	110	45	114	48
6	85	40	81	38	80	30	86	35
7	95	40	91	37	126+	55	126+	55
8	—	—	—	—	—	—	—	—
9	88	45	80	33	98	39	104	42
10	82	33	83	34	81	30	76	25
11	94	44	86	36	100	44	104	46
12	84	32	81	30	100	44	102	45
13	74	12	75	13	99	36	106	41
14	88	28	78	15	76	22	80	28
15	80	32	79	31	109	48	95	41
16	—	—	—	—	—	—	—	—
17	83	37	76	29	89—	24	89—	26
18	91	49	86	42	86	34	87	35
19	82	32	80	30	79	28	81	29
20	104	48	99	43	115	51	115	51
Means	87·78	39·44	83·50	34·33	99·5	38·72	100·33	39·50
S.D.s	7·04	10·15	6·61	9·98	16·02	10·50	15·63	9·98
Non-Dominant Cases								
21	—	—	—	—	—	—	—	—
22	121	73	118	71	121	53	121	53
23	83	37	83	37	85	33	86	34
24	123	73	123	73	116	51	121	54
25	95	53	95	53	119	52	118	51
26	97	49	98	50	117	52	126+	56
27	90	36	90	36	111	49	115	51
28	—	—	—	—	—	—	—	—
29	115	58	110	56	89	37	117	52
30	—	—	—	—	—	—	—	—
31	74—	18	74—	19	74	23	76	25
Means	99·75	49·62	98·87	49·37	104·00	43·75	110·00	47·00
S.D.s	18·10	18·97	17·06	18·28	18·37	11·30	18·39	11·19
Means for Total Group	91·46	42·58	88·23	38·96	100·88	40·27	103·3	41·81
S.D.s	12·54	13·92	12·79	14·54	16·53	10·79	16·78	10·74

PRE-OPERATIVE RESULTS

(i) *Comparison of "Dominant" and "Non-dominant" Groups*

Table IV includes assessments of the group differences in mean scores. The "non-dominant" group tends to attain higher scores on all tests but this trend achieves significance (P ·05) for the Mill Hill test only. The Mill Hill and Matrices scores are expressed as I.Q.s (Jones, 1956), since raw scores are not equivalent at different age levels.

TABLE IV

Statistical Analysis of Results A. Significance of Mean Differences between "Dominant" and "Non-Dominant" Cases

	"Dominant" Cases		"Non-Dominant" Cases		"t"	Probability
	Mean	S.D.	Mean	S.D.		
Age at time of examination	27·70	10·50	26·18	10·34	·39	> ·50
Duration of seizures ..	14·45	8·07	16·27	11·00	·51	> ·50
Age of onset of seizures ..	13·25	10·28	9·91	6·95	·97	< ·40 > ·30
Pre-operative Wechsler Full Scale I.Q.	95·90	15·46	101·00	18·83	·81	< ·50 > ·40
Pre-operative Wechsler Verbal Scale I.Q. ..	93·70	13·09	102·27	16·32	1·60	< ·20 > ·10
Pre-operative Wechsler Performance Scale I.Q.	98·85	17·23	99·91	20·01	·15	> ·50
Pre-operative Mill Hill I.Q.	87·78	7·04	99·75	18·1	2·48 *	< ·05 > ·01
Pre-operative Matrices I.Q.	99·50	16·02	104·00	18·37	·62	> ·50
Post-operative Wechsler Full Scale I.Q.	86·25	16·69	101·45	19·26	2·30 *	< ·05 > ·01
Post-operative Wechsler Verbal Scale I.Q. ..	83·90	15·31	104·00	19·57	3·17	< ·005†
Post-operative Wechsler Performance Scale I.Q.	90·70	17·44	98·73	17·97	1·21	< ·30 > ·20
Post-operative Mill Hill I.Q.	83·50	6·61	98·87	17·06	3·37	< ·005†
Post-operative Matrices I.Q.	100·33	15·63	110·00	18·39	1·38	·20 ·10

* Significant at the 5 per cent. level of confidence.
† Significant at the 1 per cent. level of confidence.

(ii) *Comparison of "Verbal" and "Non-verbal" Scores*

Table V refers to the mean differences between verbal and non-verbal scores. For the total group the findings are consistent with our first prediction. On the Wechsler test the verbal I.Q.s tend to be lower than the performance I.Q.s but this trend fails to achieve significance. The difference between Mill Hill and Matrices mean I.Q.s is, however, large, significant and favours the latter test.

For the "dominant" group our prediction is also, in general, confirmed. On the Wechsler test the superiority of "performance" scores is greater than that for the total group but falls short of an acceptable level of significance. However, two-tailed tests of significance have been used throughout this investigation as the predictions being tested do not derive from any theory of cerebral functioning but are expectations based on an *ad hoc* interpretation of previous contradictory results. As, however, formal statements of such expectancies were made prior to the experiment it might be argued that one-tailed tests of significance are justified. On such a test this difference becomes significant at the 5 per cent. level of confidence. For the Mill Hill and Matrices tests the hypothesis is strongly supported on a two-tailed test of significance.

For the "non-dominant" group our original prediction of a "non-verbal" deficit fails to be confirmed. The Wechsler test produces an insignificant trend in the predicted direction but, on the Mill Hill and Matrices tests, this trend, while still insignificant, is reversed in direction.

TABLE V

Statistical Analysis of Results B. Significance of Mean Differences between Verbal and Non-Verbal Intelligence Test Scores

Scores Before Operation

	Wechsler Verbal I.Q.		Wechsler Performance I.Q.		A§	Probability	Mill Hill Vocabulary I.Q.		Matrices I.Q.		A	Probability
	Mean	S.D.	Mean	S.D.			Mean	S.D.	Mean	S.D.		
Dominant cases ..	93·70	13·09	98·85	17·23	·28	< ·10	87·78	7·04	99·5	16·02	·13	< ·01†
Non-dominant cases	102·27	16·32	99·91	20·01	2·17	> ·10	99·75	18·1	104·00	18·37	1·86	> ·10
Total cases ..	96·74	14·65	99·23	17·94	·74	> ·10	91·46	12·54	100·88	16·53	·13	< ·01†
Scores After Operation												
Dominant cases ..	83·90	15·31	90·70	17·44	·15	< ·01†	83·50	6·61	100·33	15·63	·10	< ·001‡
Non-dominant cases	104·00	19·57	98·73	17·97	·59	> ·10	98·87	17·06	110·00	18·39	·25	< ·05*
Total cases ..	91·03	19·28	93·55	17·76	·77	> ·10	88·23	12·79	103·03	16·78	·06	< ·001‡

* Significant at the 5 per cent. level of confidence.
† Significant at the 1 per cent. level of confidence.
‡ Significant at the 0·1 per cent. level of confidence.
§ As the scores involved in these comparisons are correlated the significances of the differences between mean scores were calculated by means of Sandler's (1955) A test.

TABLE VI

Statistical Analysis of Results C. Significance of Mean Differences Between Pre-operational and Post-operational Test Scores

	Dominant Cases						Non-Dominant Cases					
	Pre-operation		Post-operation		A	Probability	Pre-operation		Post-operation		A	Probability
	Mean	S.D.	Mean	S.D.			Mean	S.D.	Mean	S.D.		
Wechsler Verbal I.Q.	93·70	13·09	83·90	15·31	·102	< ·001†	102·27	16·32	104·00	19·57	1·521	> ·10
Wechsler Performance I.Q. ..	98·85	17·23	90·70	17·44	·133	< ·01*	99·91	20·01	98·73	17·97	4·04	> ·10
Wechsler Full Scale I.Q. ..	95·90	15·46	86·25	16·69	·100	< ·001†	101·00	18·83	101·45	19·26	19·88	> ·10
Mill Hill Raw Scores	39·44	10·15	34·33	9·98	·108	< ·001†	49·62	18·97	49·37	18·28	2·5	> ·10
Matrices Raw Scores	38·72	10·50	39·50	9·98	1·01	> ·10	43·75	11·30	47·00	11·19	·385	> ·10
Wechsler Verbal/Performance Discrepancy ..	–5·15		–6·80		2·3	> ·10	2·36		5·27		·855	> ·10
Mill Hill/Matrices Discrepancy ..	·72		–5·17		·149	< ·01*	5·87		2·37		·381	> ·10

* Significant at the 1 per cent. level of confidence.
† Significant at the 0·1 per cent. level of confidence.

EFFECTS OF THE OPERATION

Post-operatively, the pre-operative patterns of group and test differences persist and are exaggerated. The "non-dominant" group shows increased superiority on all tests; the differences for the Wechsler Verbal and Full Scales, as well as for the Mill Hill test, now reach various levels of statistical significance (Table IV). The "verbal deficit" shown by the "dominant" group becomes highly significant for both groups of tests while that for the total group is increased when measured by the Mill Hill and Matrices tests (Table V). The latter change cannot, however, be strictly assessed owing to uncontrolled practice effects on the Matrices scores. The "non-dominant" group now shows a significant superiority on the Matrices as compared with the Mill Hill test but this again may result from practice effects (Table V).

These changes, as may be seen from Table VI, result mainly from a post-operative decline in test scores shown by the "dominant" group. This decline is highly significant for all tests except the Matrices where a slight gain occurred which, however, is probably offset by the practice effects previously mentioned. The decline is more marked on the verbal than on the non-verbal scales as is reflected in the increased discrepancy scores. Only one of the two changes in discrepancy is, however, significant and this, again, is affected by gains on the Matrices test.

The "non-dominant" group produced no significant changes on any measure and, in fact, increased their scores on the Wechsler Verbal and Full Scales and the Matrices test. The latter gain may again be offset by practice effects. Table VII presents the mean changes for both groups on all subtests of the Wechsler Scale. The "dominant" group declines somewhat on all ten sub-tests, itself an indication of a significant trend, while the "non-dominant" group produces no consistent pattern of change. Of the three absolute declines one occurs on a verbal sub-test and the two sub-tests most closely related to visuo-spatial ability, "Block Design" and "Object Assembly", both show an increase in mean score. Thus the operation on the "non-dominant" hemisphere did not appear to affect any specific ability involved in the tests.

TABLE VII

Mean Changes in Wechsler Weighted Sub-test Scores After Operation

Sub-test	Dominant Cases N=18	Non-Dominant Cases N=9
Comprehension	−1·67	−0·77
Arithmetic	−1·44	+0·67
Similarities	−1·39	0·00
Digit Span	−1·33	+0·11
Vocabulary	−1·11	+0·44
Picture Completion	−1·17	−0·78
Picture Arrangement	−1·00	+0·11
Block Design	−0·55	+0·11
Object Assembly	−1·00	+0·44
Digit Symbol	−1·28	−1·00

EFFECTS OF AGE, AGE OF ONSET, AND DURATION OF SEIZURES ON TEST PATTERNS

Correlations are frequently reported between intelligence test results, on the one hand, and age of onset and duration of illness, on the other hand, without regard to the lack of independence between the latter two variables (Jones, 1953). Age, age of onset, and duration of illness are intimately related and no one variable can be considered in isolation.

Table VIII presents (*a*) the original intercorrelations between age, age of onset, duration of seizures, and "verbal deficit" scores from the Wechsler Scale for the 20 patients of the "dominant" group and (*b*) all the possible "partial correlations" between the "verbal deficit" scores and the other variables. None of the coefficients approaches significance. Thus it is unlikely that any of these variables has any marked effect on the test pattern.

Table VIII

Statistical Analysis of Results D. Effects of Age, Age of Onset and Duration of Seizures on Pre-operational Wechsler Verbal/Performance Discrepancies for the Dominant Cases

A. Intercorrelations Between the Variables:

	Duration of Seizures	Age of Onset	Verbal Deficit
Age	·411	·699	·105
Duration of seizures	·	—·365	·088
Age of onset	·	·	·038

B. 1st Order Partial Correlations:

Variable Held Constant	Partial Correlations with Verbal Deficit		
	Age	Duration of Seizures	Age of Onset
Age	·	·049	—·049
Duration of seizures	·076	·	·076
Age of onset	·110	·110	·

Discussion

The results, in general, confirm our predictions that an unselected sample of patients with temporal lobe abnormalities will tend to score lower on verbal than on non-verbal tests, and that this trend will derive from a high incidence of right-handed patients with abnormalities of the left temporal lobe and the marked tendency of these patients to exhibit verbal deficits. Contrary to expectation, however, right-handed patients with right-side temporal lobe abnormalities failed to score lower on non-verbal than on verbal tests. The latter finding conflicts with reports of Anderson (1951) and Milner (1954) but agrees with those of Meyer and Yates (1955), and Heilbrun (1956). The present results are only directly comparable with those of Milner and Meyer and Yates.

A possible explanation of this discrepancy may lie in Milner's statement that the most severe disturbance of spatial ability occurred in cases of right temporal lobectomy in which the excision extended far back along the inferior surface of the temporal lobe. There is evidence (Weisenburg and McBride, 1935; McFie *et al.*, 1950; McFie and Piercy, 1952; Semmes *et al.*, 1955) that injury to the parietal lobes results in severe impairment of visual space orientation. In several of Milner's cases, the excision may have extended to the parietal lobe but, even so, it is surprising that her "right-temporal" group was inferior on spatial tasks to a control group including "parietal" cases.

The effects of the operation, in the present investigation, were to enhance the pre-operative test patterns, mainly by lowering the scores, both verbal and non-verbal, of the "dominant" group. The depression of the verbal scores may, in agreement with Heilbrun's view, result from the development of dysphasia; practically all "dominant" patients manifested some amnesic dysphasia after the operation. It is possible that the pre-operative verbal deficits of the "dominant" group may represent a sub-clinical condition lying on the same physiological continuum as clinically manifest dysphasia. An investigation into the nature of this deficit is at present in progress. The post-operative decline in Performance scores of the "dominant" group cannot be accounted for solely in terms of visual defects as the "non-dominant" group had similar defects but showed only a very slight and insignificant decline on the Performance Scale.

Throughout this investigation the Wechsler Performance Scale produced results more consistent with expectation than did the Matrices test. This is probably in large part due to the lack of control data concerning practice effects on the Matrices. Moreover the Matrices, unlike the Wechsler Performance Scale, is minimally related to spatial ability. The Matrices were administered in the untimed version, whereas the Performance Scale has time-limits. The patients took longer to complete the Matrices after the operation. Though this difference was not statistically significant, the absence of a time limit for the Matrices may have allowed the patients to overcome difficulties resulting from visual disturbances and dysphasia. Finally, the Matrices involve minimal verbal instructions and may, therefore, be less affected by dysphasic symptoms.

The verbal deficit characteristic of the "dominant" group is by no means universal. This is to be expected as genetic endowment, education and cultural background are important determinants of an individual's pattern of cognitive test scores. The degree of specialization of each cerebral hemisphere in respect of language functions may also be of importance. The importance of the age of onset of a disease process has been stressed by Rey (1956). He quotes Foulds and Raven (1948) as demonstrating that reasoning ability, as tested by the Matrices, increases rapidly during childhood, reaches a maximum at about 14 years, remains constant until about 25 years and then declines slowly. The ability to recall information, as in a vocabulary test, continues to improve, albeit slowly, into late adulthood. Thus, argues Rey, the earlier the injury to the "dominant" temporal lobe, the greater the resultant verbal deficit owing to the relatively greater immaturity of verbal as compared with non-verbal functions. This argument, however, assumes that the effect of injury is simply to halt developmental processes and neglects the important fact of the greater functional neural plasticity of the younger individual. Indeed, the fact of longer verbal maturation might reflect greater and more prolonged neural plasticity in respect of language functions as indicated by the frequent recoveries from dysphasic disorders in adult patients. Whatever the strength of this argument the results of this investigation fail to support it; there is no evidence of any relationship between the age of onset of seizures and the Wechsler Verbal/Performance discrepancies in the "dominant" group.

SUMMARY

A review of investigations into the effects of brain injury on patterns of cognitive test performance suggested two, apparently contradictory, generalizations. Some studies appeared to indicate that patients with left-sided lesions score lower on verbal than on non-verbal tests and that patients with right-sided lesions acquire deficits in relation to non-verbal tasks while a second group of studies indicated that verbal deficits are associated with lesions of the temporal lobe, irrespective of laterality. It was postulated that this contradiction arises from the fact that lesions tend to occur more frequently in the left than the right temporal lobe, and, on the basis of this notion, the following predictions were made:

1. A sample of patients with temporal lobe epilepsy will, as a group, tend to score lower on verbal than on non-verbal tests.

2. Right-handed patients with left-sided abnormalities will exhibit this trend towards lower verbal scores to a marked degree.

3. Right-handed patients with right-sided abnormalities will, as a group, tend to score lower on non-verbal than on verbal tests.

These predictions were tested on a group of 31 such patients studied before and 1 month after operation, and the results obtained tended to confirm the first two predictions and failed to confirm the third. All the patients were submitted to temporal lobectomy, which tended to accentuate the pre-operational test patterns, mainly owing to differential declines on all test scores shown by the patients who were operated on on the left side. The results failed to reveal any relationship between the cognitive test pattern and age, age of onset and duration of seizures. These findings are discussed in relation to those of other workers.

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THE CLINICAL SIGNIFICANCE OF OBSESSIONS IN SCHIZOPHRENIA*

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It is well known that obsessive-compulsive symptoms may occur in the prodromal phase or in the course of schizophrenia, and that schizophrenic symptoms may supervene in a long-standing obsessional neurosis. Stengel (1945) has reviewed much of the earlier literature concerning the relationships between obsessional neurosis and schizophrenia. The question whether obsessional neurosis could develop into schizophrenia has often been discussed. Pilcz (1922), Legewie (1923) and Schneider (1925) distinguished between genuine obsessions which were symptoms of an obsessional neurosis, and symptomatic obsessional ideas which could occur in various conditions. These authors, as well as Stekel (1950), doubted whether a genuine obsessional neurosis could develop into schizophrenia. Bleuler (1911) thought that some patients suffering with chronic obsessional symptoms were in fact schizophrenic, especially where a schizophrenic psychosis had been observed in the family. Mayer-Gross (1932) expressed the view that cases of obsessive-compulsive neurosis existing over decades without change and presenting marked autism were often schizophrenics. Together with Bleuler, Mayer-Gross suspected that many of Janet's "psychasthenic" patients had been schizophrenic. Janet (1903) had observed 3,000 cases of psychasthenia, of which 12 developed into psychosis, and two into hebephrenia, but Janet's psychasthenia probably included cases other than obsessional neurosis. There is a well-known case which showed how in the course of a long-standing obsessional neurosis, paranoid schizophrenic symptoms may make their appearance. This is the patient described by Freud (1918) in "The History of an Infantile Neurosis", who, many years after he had been treated by Freud for obsessional symptoms, was treated for a paranoid state by Ruth Mack Brunswick (1928).

Jahrreis (1926) attempted to establish the incidence of obsessive-compulsive symptoms in schizophrenia. He perused the case notes of 1,000 schizophrenics admitted to the Munich University Klinik, and found that in 11 cases only, obsessional symptoms had been noted. He studied 16 selected cases and noted that in only five of them had obsessional phenomena been in the foreground of the clinical picture, and had tended to cause diagnostic difficulties at times in the course of the schizophrenic development.

Binder (1944, 1945) in studying the relationship between compulsion and criminality, surveyed 60 patients with obsessional symptoms in a number of Swiss mental hospitals. All of them had at some time of their development committed criminal offences. In 17 cases, psychotic development could be established. Binder distinguished between the elaborate psychogenic obsessional symptoms and what he called organic obsessional phenomena. He thought that if in persons suffering from obsessional neurosis, a schizophrenic or organic psychosis supervened, the obsessional ideas might be transformed into delusions and the compulsions into impulsive acts which could lead to criminal offences.

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Stengel (1945) observed that obsessive-compulsive symptoms tended to prevent or retard disintegration of the personality in schizophrenics. Muller (1953) followed up all cases of obsessional neurosis admitted to the Psychiatric University Hospital of Zurich at least 25 years previously. He collected 57 cases in all. Of those, 7 had developed into schizophrenia, 2 were probably schizophrenics and 2 were manic-depressives. His study was particularly important as follow-ups over long periods are lacking in the literature, and because his material was unselected. He attempted to study the question whether there was any difference in the course of schizophrenia with and without obsessions. He particularly attempted to test the views expressed by Stengel on this point. Of the 7 schizophrenics, only 4 had to enter mental hospitals at some time, while 3 were still socially well adjusted. In all of them, including the 2 doubtful schizophrenics, the psychosis had progressed very slowly and insidiously. Like Stengel, he observed cases in whom a transient disappearance of obsessional symptoms was associated with a release of strong aggressive impulses. He also confirmed Stengel's observations that in the cases where obsessional symptoms of long standing had preceded the emergence of schizophrenia, the latter had taken a comparatively benign course, which was not found to be the case in those patients with a short history of obsessional symptoms.

The question of the transition of obsessional ideas into delusions has been discussed by different authors; it has often been assumed, that it should be far from rare, that the step from the obsessional idea to a delusion occurs, i.e. the belief that a thought content which was resisted does not originate in one's own mind but was put there by somebody else. However, it seems that this transition is a very infrequent occurrence. Some students of the problem do not seem to have observed it at all. Mayer-Gross does not mention it. Stengel (1945) observed that the instincts, desires and fears which the obsessional idea or compulsion served to suppress or control, and which often remained unconscious, sometimes appeared in consciousness by way of projection. It was not the obsessional idea or the compulsion that was projected but something that was represented by the obsessional idea in a distorted and often unrecognizable form. This happened in some patients of his material and in cases reported in the literature. Only in this sense could he confirm the statement that obsessions may change into delusions. On the other hand, Henderson and Gillespie (1944), and Gordon (1950) described cases where the direct transformation of an obsession into a delusion was noted as having taken place.

In this study an attempt has been made to contribute to some of the problems arising from the successive or simultaneous appearance of obsessional and schizophrenic symptoms. That this occurs can now be regarded as established, but this is about the only fact on which full agreement exists among psychiatrists. Its significance, however, for the course and prognosis of the schizophrenic illness has only recently come to be considered, and this problem is still very much in need of investigation.

The case material used in this study was the total number of schizophrenics admitted to the Bethlem Royal Hospital and the Maudsley Hospital, from 1 July, 1949 to July, 1953, who had at some time had obsessional symptoms. During the period surveyed there was a total of 5,467 in-patients admitted to the Joint Hospital of whom 848 were schizophrenics of all types. Among those schizophrenics there were 30 patients in whom obsessional symptoms had been observed at some time. The cases studied, therefore, formed 3·5 per cent. of the total schizophrenic in-patient population.

Although the two hospitals do not serve a specific geographical area and can select their cases, it has always been the policy that the material should be representative of the distribution of mental disorder among the general population. It is, of course, true that the turnover of these hospitals, whose main functions are teaching and research, is greater than that of a mental hospital of the same size, but care is being taken too, that cases of long standing, irrespective of their prognosis, are admitted and studied before being sent to their local mental hospital.

The proportion of schizophrenics who at some time had obsessional symptoms found in this hospital population may appear comparatively large in view of the alleged rarity of this combination. This is possibly due to the fact that the case material was more thoroughly investigated than that available to most earlier writers on this subject.

Sex Incidence: There were eleven males and nineteen females in this group.

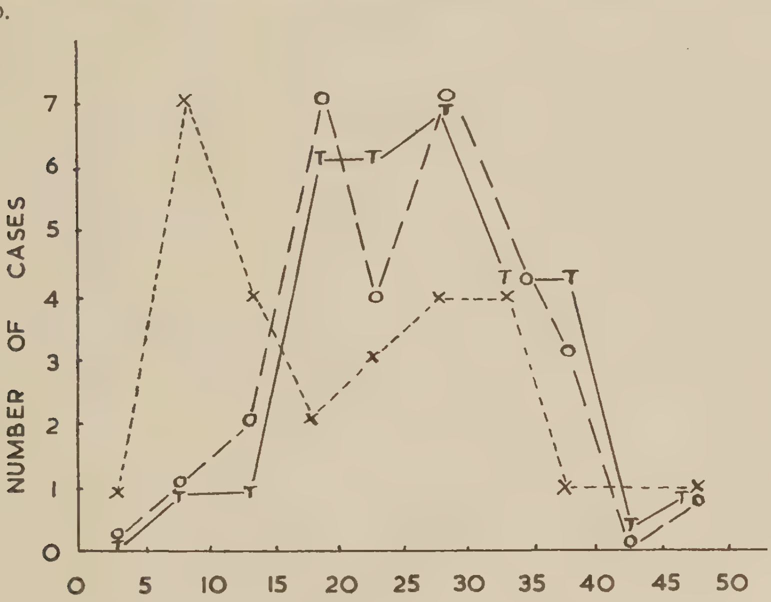

FIG. 1

AGE OF ONSET:

1. *Onset of obsessional symptoms:* From the accompanying graph (Fig. 1) it may be seen that there were two peaks of ages of onset. The first was in childhood and early adolescence. Eight cases developed symptoms before the age of ten years, a further six cases before the age of twenty. Eleven cases developed symptoms between the ages of twenty-one and thirty-five, forming the second peak.

2. *Onset of schizophrenic symptoms:* From the graph it will be seen that there was a major incidence of onset between the ages of fifteen to thirty-five. Twenty-two cases were in this group.

3. *Age of first psychiatric attention:* This followed closely the pattern of the schizophrenic symptom onset. The early obsessional symptoms had not received medical attention and were usually established retrospectively; five patients had had them for more than ten years before treatment.

Heredity: As this aspect was not studied *ad hoc*, the results were thought to be too unreliable for inclusion here.

Premorbid personality: Each patient was retrospectively scored for schizoid and syntonic traits according to criteria laid down by Bowlby (1940). Only fourteen cases gave evidence of having had schizoid personalities before the onset of schizophrenic symptoms, while the personality traits in the rest of the patients had been non-specific.

Mode of onset of illness: With regard to retrospectively establishing the first symptoms to appear, there is a difference in the accuracy with which this can be done for schizophrenic and for obsessional manifestations. Because schizophrenia often commences with a gradual behaviour change of which the patient is unaware, it may be difficult to note the initial symptoms. With obsessions, on the other hand, one of the essential features is the striking experience of subjective compulsion so that their onset can be established fairly precisely.

There were four main groups of onset symptoms. These were (*a*) obsessional only, (*b*) affective, (*c*) schizophrenic and obsessional symptoms and (*d*) non-specific disorders.

(*a*) *Obsessional only:* Eight cases, of whom one (case 9) had had touching rituals at the age of ten. Six patients had endured obsessional illness for longer than two years, four of these six had contamination fears. In one patient (case 13) a compulsion to shout out names had been present for a few months before the onset of schizophrenia. The following are extracts from the records of the six patients mentioned above. These extracts refer only to the obsessive-compulsive symptoms which had preceded the schizophrenic symptoms.

Case No. 2 had compulsive handwashing from the age of seven, for fear of contracting diseases from coins, and later developed a fear of V.D. This was diagnosed as a compulsive neurosis and lasted for twenty years almost continuously until the onset of typical schizophrenic symptoms. At times she sought reassurance from doctors.

Case No. 3, a girl of eighteen, had, at the age of eleven, had a phobia that her food might be contaminated, with corresponding compulsive precautions. Schizophrenic manifestions were apparent at the age of fifteen.

Case No. 21 developed a phobia of V.D. and a washing compulsion at the age of sixteen. Schizophrenic symptoms developed two years later.

Case No. 27 was afraid of giving a disease to someone, prayed to God, and performed atoning rituals in consequence. This commenced at the age of fifteen: schizophrenic symptoms made their first appearance when she was eighteen.

Case No. 10 had the compulsive thought that she might kill someone, starting at the age of fourteen: schizophrenic symptoms appeared at the age of eighteen.

Case No. 22 had the urge to look at men's genitals for two years before paranoid mechanisms became evident at the age of twenty-eight. Her life was disturbed by these initial symptoms.

Thus, in six of the cases, there had been persistent, stable and systematized obsessional symptoms lasting several years prior to the appearance of schizophrenic symptoms, with their onset in the first or second decades of life. The sexual and aggressive, or sadomasochistic, nature of these symptoms was noteworthy.

(*b*) *Affective:* In six cases, depression had been the first presenting symptom prior to obsessive and schizophrenic manifestations. Manic mood disorder was not observed in any case.

(*c*) *Both schizophrenic and obsessional symptoms at onset:* Nine cases. Ideas of reference were the commonest presenting symptom in these patients. Obsessions were present simultaneously in all, although the schizophrenic symptoms predominated from the start.

(*d*) *Non-specific behaviour disorders:* In seven cases, the first symptoms were general behaviour disorders which appeared to be non-specific at the time. In five patients, lack of concentration, social withdrawal, social difficulties, and apathy had been the principal features. The other two showed aggressive behaviour with rage and excitement in one and a quarrelsome, aggressive, hypochondriacal attitude in the other. It is interesting to note that all these cases showed obsessional symptoms prior to the onset of the more specific schizophrenic symptoms, so that signs which might have made the onset of schizophrenia more patently evident did not appear until later and left the true nature of the process in initial doubt.

Obsessional symptoms occurring for the first time after the development of Schizophrenia: In no case of this material did obsessional symptoms establish themselves after schizophrenic symptoms had appeared.

Types of schizophrenic reactions: In all the cases, the diagnosis of schizophrenia had been made or confirmed by experienced psychiatrists. In most cases several such persons had concurred. Twenty-six patients had paranoid symptoms as a feature of the illness sufficient to warrant the diagnosis of paranoid state or paranoid schizophrenia at some time or another. Of the remaining four cases, No. 11 was a case of hebephrenic schizophrenia which probably had developed out of a childhood schizophrenia. Case No. 20 was a juvenile schizophrenia. There were two cases of schizo-affective psychosis.

Most patients showed disturbances in several important spheres of mental functioning and there was no case which did not show the combination of at least two of the categories of thought, mood and behaviour disturbances. All patients except three had delusions. The exceptions were the two juvenile schizophrenias and one case with ideas of reference only. Hallucinations were present in nineteen cases. There was a change of social adjustment in all cases, while nineteen showed withdrawal of serious degree. Ideas of influence or passivity were present in nine cases. Thought disorder was present in six cases.

The Course of the Illness: The thirty patients were scored for the duration in weeks of stay in hospital, and the period of remissions out of hospital. The time spent in out-patient treatment prior to being admitted to hospital was not taken into account.

Phases in Hospital: Thirteen cases had only one phase in hospital, six cases had two phases, seven had three phases, three had four phases and one case was in hospital five different times. The average number of phases in hospital was 2·1 per patient. The average time spent in hospital was 63·7 weeks, the range being very wide, from one week to two hundred and eighty-nine weeks. Thirteen patients were in hospital at the time of follow-up. Of those, five had shown schizophrenic symptoms for less than two years.

Phases of remission: Remission was taken to be a stay of at least one month out of hospital. Ten patients had one such phase, eight had two phases, seven had three phases, three patients had four phases and one patient five phases. The average number of remission phases per patient was 1·7. The length of the remissions varied more widely than the duration of stay in hospital, as some patients were able to remain out of hospital for many years between attacks. In a few cases, these were up to four and eight years. The average total time spent in remission was found to be 143·8 weeks. Seventeen cases were in remission at the time of follow-up.

An examination of those patients who had been ill for longer than two years including remission, revealed the following. There were seventeen such patients. They had an average of 2·7 phases of illness with a mean of 87·9 weeks spent in hospital. They averaged 2·3 phases of remission of 232·5 weeks total. Eight of them were in hospital on follow-up, which was on an average of 6·1 years. Although this group had an average length of stay in hospital greater than the whole, their average phase of remission and length of remission were also greater, showing the maintenance of the trend towards periodic breakdown and remission.

Mental state at the time of Follow-up: The thirty cases were followed up for an average length of time of 5·3 years from the date of their first psychiatric attention or admission. One case was symptom-free. Eight were at home working: they had recovered with some defect. Eight patients were at home but not working. Six of the thirteen in-patients had had no remissions, but three of the latter had only been in hospital from 6 to 28 weeks.

Obsessional Symptoms in Relation to the Development of Schizophrenia: It was found possible to subdivide the cases into (*A*) those with obsessional symptoms which had been long-standing or present for over two years prior to the onset of schizophrenia. There were fourteen such cases. (*B*) Those cases with obsessional symptoms emerging just prior to, or within a year of onset of schizophrenia. Five cases. (*C*) Those cases with obsessional symptoms emerging coincident with schizophrenia. Eight cases. It was impossible to classify three cases because the onset of the obsessional symptoms was not known.

The fate of the Obsessional symptoms after the onset of Schizophrenia: The most striking and significant finding was that in twenty-three patients the obsessional symptoms persisted largely unchanged in content and degree of severity after the onset of schizophrenia. Of these, ten showed an increase in the severity of their symptoms at some time in the illness, the content remaining the same, while in six of them new obsessional symptoms appeared in addition to the others. In three cases, the obsessional symptoms receded into the background, this being a result of leucotomy in two. Six cases showed improvement in the obsessional symptoms with remissions of the illness generally, while in one other case they grew worse in remission.

Contents and Types of the Obsessional symptoms: These were classified into the four types of obsessional ideas, compulsions, phobias and ruminations.

Incidence: Among the thirty cases, the incidence of obsessional ideas, phobias and ruminations was about equal, there being fifteen cases in the phobic group and sixteen in the other two groups. Compulsions were more universally present and appeared in twenty-seven cases. The combination of symptoms revealed that seven cases had all four groups of obsessional symptoms, eight cases had three of the obsessional groups, eight cases had two of the groups, and seven cases had one group only.

CONTENT:

A. Obsessional ideas. There was usually one basic feature in each case, such as obscene word repetitions; sexual thoughts, mostly about intercourse; magical thinking; aggressive phantasies of killing or suicide, counting, or unspecified unpleasant ideas.

B. Compulsions: Here the groupings were more diverse. Compulsive washing and bathing were present in ten cases, touching rituals in four cases, looking rituals, vocal repetitions, prayer rituals and other behaviour rituals as well as destructive compulsions were present in 27 cases.

C. Phobias: In eight cases the fears were closely related to the obsessional ideas or impulses, with some further elaboration. However, they all fell into the categories of either sex or aggression or both.

D. Ruminations: These concerned ethics and morality, such as doubts as to good and evil, God and Truth, sex and others of a philosophical or magical nature.

The Transition of Obsessions into Delusions: Three possible ways of a transition of obsessions into delusions can be envisaged. There may be found singly or in various combinations.

(*a*) An obsessional idea, which has been experienced as arising from the self, is replaced by the conviction that it is planted into one's mind from outside. This would represent the well-known mechanism of projection; (*b*) The obsessional ideas, still experienced as such, may be experienced as caused by someone else; (*c*) The insight into the morbid nature of the idea becomes lost and the idea is held to be true, e.g. an obsessional fear of contamination becomes a belief in being poisoned.

Among the cases investigated, each of these three changes of obsessional ideas was observed. Six patients were found to have had a transition from obsessions to delusions. These were a combination of types (*a*) and (*b*) in three cases, while there was one case each of types (*b*) and (*c*) and their combination.

Transitions have not been considered to have taken place where obsessional ideas disappeared and were replaced by delusions, or co-existed with them for a time and then faded out. It seems that in the literature, this sequence had often been described as a transition.

The following four cases exemplify transitions of obsessional ideas into delusions.

Case No. 10: For four years, this patient had the persistent idea that she might harm someone. Suddenly at Communion she heard God's voice saying she might harm Him. She later developed bizarre rituals to placate God. The constant rumination of her killing someone persisted. She was not entirely convinced that the hallucinations were due to her imagination. The delusion that she could harm God distressed her and was seldom out of her mind. Although she believed this, she was aware of the absurdity of her rituals to placate Him. The combination of types (*a*) and (*b*) was seen in the obsessional idea being replaced with the conviction that it was caused by an outside source, but the idea still persisted in its original form.

Case No. 21: Fears of contamination and destruction through loose objects lying about gave rise to delusions of being poisoned and hallucinations of people falling off roofs and being pushed down drains. With regard to the hallucinations and delusions, he often admitted that these may have been the product of his imagination, but he could not convince himself of this fact. There was doubt in his delusions therefore, and the obsessional washing rituals and fears of contamination persisted with the belief that he was being poisoned. In this case one can speak of a transition from an obsession into a delusion. Fears of contamination gave way to a delusion of being poisoned and are an example of type (*c*).

Case No. 22: This patient's illness commenced with the compulsive urge to look at men's genitals which she resisted and felt to be absurd. The compulsion persisted throughout her whole schizophrenic illness and was less in intensity at times. Her delusions were centred around sex, and she believed that everyone knew she had the compulsions mentioned and that she had a dirty mind. However, the actual transition of the obsessional urge coming from within to being caused by outside influences did not occur. Obsessional word repetitions of swear words did however, give way to hallucinations where the same words were said by the voices; she believed people really said these things. Thus a transition of types (*b*) and (*c*) occurred in this patient.

Case No. 30: This patient had obsessional ideas in the form of words such as "Radar" and "Crime", which came into her mind from within, which she resisted and felt to be absurd. When schizophrenia developed she felt that someone was putting obscene thoughts and words into her head and these included those already mentioned as obsessional. These same words were used by the hallucinatory voices which harangued her. The words referred to her guilt over a sexual affair of long standing. Type (*b*) transition appeared to have taken place.

Depressive Symptoms: Twenty-five of the patients were clinically depressed at some time or another during their illness. Eleven had depression lasting several weeks as a feature of the onset of their illness. Diagnostic difficulties seemed to arise in the early stages as a result of this in some patients. One was called a psychopathic personality with depression, two others were labelled adolescent affective disorders, while, in the final diagnoses, the term schizo-affective psychosis was used in three cases because the affective features were so prominent. This diagnosis presupposes a predisposition to both schizophrenia and manic-depressive psychosis.

Suicidal ideas and threats were entertained by twelve patients, four of whom voiced them repeatedly. Three made suicidal attempts all of which were serious. One patient made more than a dozen serious attempts and finally hanged herself. Her depressive spells were associated with aggressive outbursts, obsessional rituals, delusions and hallucinations that she must die.

In this series, aggressive features were observed in ten cases, apart from patients with aggressive phobias, and the suicidal acts. These manifestations of aggression varied from bad tempers and quarrelsomeness to open attacks of a homicidal nature.

Response to Treatment

1. *Insulin Coma:* Fourteen patients were given high dosage insulin comas which ranged from twenty-eight to sixty-three, the majority receiving forty comas. Of these, ten cases showed improvement immediately following treatment. One patient recovered. The improvement was only temporary in several cases, and was mainly related either to an increased ability to tolerate the delusions or a better social adjustment.

2. *Electro-convulsive therapy:* Twelve cases received E.C.T. of which five had two courses. The number ranged from three to thirteen treatments. Six improved but this improvement was short-lived. The effect on the obsessions was either nil or an exacerbation in two cases. In one case they disappeared for a few days after two courses.

3. *Psychotherapy:* (*a*) Psycho-analysis. Three cases underwent what would be consistent with intensive transference analysis. Case No. 2 had two and a half years analysis which improved her to the degree that she was able to work and then removed her venereophobia. The patient felt she had been greatly helped by the treatment. The other two patients had six months and four years treatment without any material change.

(*b*) Superficial or supportive psychotherapy. Nineteen patients received such treatment. It is difficult to judge the efficacy of such treatment in terms of the sustainment it affords the patient. Apart from four cases who were helped and improved by psychotherapy at the onset of their illness, the specific results attributed to psychotherapy of this type were poor.

Leucotomy: Of the four cases, three underwent the operation of bilateral prefrontal leucotomy and one case had a cortical under-cutting of Brodman's areas 9 and 10. All four were considered to have improved to some degree. The obsessional symptoms became less intense or disappeared, but they returned after a few weeks in one case and in another after fifteen months. The schizophrenic symptoms were relieved so that a social recovery ensued, but one of these patients became aggressive and domineering. There were relapses in two cases, but at the time of follow-up, three were out of hospital although defects were present.

Discussion

Sex Incidence: Although there was a predominance of females in the ratio of nearly two to one, no conclusions can be drawn from this as the cases were not selected from a sample representative of the schizophrenic population. There is no other series of equal size in the literature. Of Stengel's seven cases, four were females.

Age Incidence: The age at which obsessional symptoms commenced in this series was found to have two peaks of incidence. The first was in childhood and puberty, and the second between the ages of twenty-one and thirty-five. Kanner (1948) states that "most authors differ with regard to the frequency of obsessions in children as compared with adults. Some state they are rare before puberty. According to others, 50 per cent or more of all adult cases can be traced back to the years of childhood." In this series, eight patients had obsessional symptoms before the age of ten, six others at puberty, or soon after. All these were typical obsessions, which in the majority persisted into adult life and formed part of the obsessional coterie in their psychosis.

Patients tended to seek psychiatric treatment only when the schizophrenic symptoms were manifest. This is in keeping with the observation that obsessional neurotics endeavour to cope with their obsessive-compulsive symptoms without medical help, and to keep them secret as long as possible (Stengel, 1956).

Premorbid Personality: In this series there were fourteen cases with schizoid premorbid personalities. These included the only five patients who were not reported to be clinically depressed during their illness. Only six of the fourteen cases were in hospital at follow-up. In this series, therefore, the presence of a schizoid personality was not associated with any special type of onset of obsessional symptoms or of the course of the illness, except that those patients who lacked strong affective responses were usually of this type.

Mode of Onset of Illness: It has been shown that the onset of illness revealed itself in four different ways. There were (*a*) only obsessional symptoms, (*b*) affective symptoms, (*c*) both obsessional and schizophrenic symptoms, (*d*) evidence of a non-specific behaviour disorder. A retrospective scouting of the case material showed that it would not have been possible to predict the development of schizophrenia before the appearance of schizophrenic symptoms, in cases belonging to types (*a*), (*b*) and (*d*).

Diagnosis: The diagnosis of these conditions presents difficulty, especially in the early stages of the disease when obsessional symptoms may be prominent and schizophrenic manifestations not fully established. The tendency is usually to regard the cases as being those of obsessional disorder with paranoid or schizoid features until definite signs of schizophrenia make their appearance. Where a clinician has seen a case only once, it may be very difficult to come to the diagnosis of schizophrenia as the symptoms, particularly the delusions, may be said, as in the Hoch and Polatin study, to "zig-zag over the reality line". This has led to them being called "pseudo-delusions" (Fenichel). The mood fluctuations which often colour the whole picture may also be misleading and lead to a diagnosis of atypical depression. In this group of cases, it is necessary even more than in schizophrenia in general to base the diagnosis on careful clinical observation covering a long period. Schizophrenic symptoms may be shortlived, and different symptoms apparent at different times. Evidence of "process" schizophrenia, such as feelings of influence or passivity, and schizophrenic thought disorder were present in fifteen cases. Twenty-six cases belonged to the paranoid reaction type. Prevalence of the paranoid reaction type was also observed by Stengel, who described in detail seven cases, five of which were paranoid, while the remaining two were classified as simple schizophrenia. This author also stated that he found a similar prevalence of the paranoid reaction type among the schizophrenics with obsessional symptoms throughout the literature. He tentatively related this to the strong integrative features inherent in obsessional mechanisms, which favoured the emergence of reaction types in which personality disintegration occurred late or never.

The Obsessional symptoms in relation to Schizophrenia: In all patients obsessional symptoms emerged either prior to, or coincident with, the development of schizophrenic symptoms. In no case among the material presented did obsessional symptoms appear for the first time after the onset of schizophrenia. However, a patient has been observed outside this series, who suffered from a long-standing paranoid state of the paraphrenic type, who developed an obsessive symptom for the first time about ten years after the onset of his delusional illness. It suddenly occurred to him that he might kill his niece. This idea had all the typical features of a compulsive thought. While he had no insight into his delusions, he had no doubt about the morbid nature of the compulsive thought mentioned. This was only of a transient nature but it frightened him so much that he sought treatment. This observation suggests that the first emergence of obsessional symptoms in the course of schizophrenia is possible. Dr. E. Stengel has told me that he has seen schizophrenics who, following leucotomy operation, had for the first time shown transient obsessive compulsive symptoms.

Content and Types of Obsessional symptoms: The obsessional symptoms were found to be no different in content, to those commonly found in uncomplicated obsessional neurotics. A sexual or aggressive basis could be inferred in all of them, depending on the level of interpretation used.

In this study it was found that those patients who had the greatest elaboration of obsessional symptoms were also those who had the largest variety of obsessional manifestations of which four types were distinguished.

Those cases with three and four varieties of obsessional symptoms were therefore thought to be in a more favourable state as far as the schizophrenic illness was concerned than those with only one or two varieties of obsessions. The former had a better elaboration of symptoms, their personalities were better preserved during the schizophrenic illness, and at follow up a higher number of them were found to be able to work and live at home than among the others. The numbers of varieties of obsessional symptoms present in the individual were correlated with their duration prior to the onset of schizophrenia (Groups *A*, *B*, *C*). Those cases with one or two varieties of obsessional symptoms present were added together and totalled fifteen cases. There was an equal number of cases showing three and four varieties. Of the fifteen cases with one and two varieties of obsession, five patients belonged to group A, where obsessions had emerged at least two years prior to schizophrenia, and five were in group C where obsessions and schizophrenic symptoms had emerged coincidentally.

Of those fifteen patients with three and four varieties of obsessions, there were nine cases in group A and only three in group C. While the small numbers of cases precluded statistical verification, there does appear to be the following trend. The longer the duration of obsessional symptoms prior to schizophrenic symptoms, the greater the number of varieties and elaboration of obsessional symptoms. There seemed to be therefore, a positive correlation between the duration of obsessional symptoms, the amount of variety and elaboration they show, and the relative benignity of the schizophrenic illness.

This would accord directly with Müller's finding that the longer the duration of obsessional symptoms prior to the onset of schizophrenia, the more benign the illness tended to be. The relationship between the long-standing obsessional symptom and the presence of affective features has been previously pointed out.

Some general considerations regarding the relationship between Obsessional neurosis and Schizophrenia: This study confirms that obsessional neurosis is sometimes followed by schizophrenia. How often this happens, it is impossible to guess at from the observations presented here. However, Müller's recent follow-up, of which a preliminary report was available, suggests that this development is not all too rare. It depends on the views a psychiatrist holds about mental disorder in general and schizophrenia in particular, whether he will regard the sequence of obsessional neurosis and schizophrenia as the unfolding of a single development, or as the occurrence of two different reaction types in one and the same individual. This study cannot contribute to a decision on which one of the two views is the correct one. The clinical observations presented here are compatible with both. Thus if one takes the view that a predisposition exists to both obsessional illness and schizophrenia, then the obsessional predisposition may be of a particular type. In these cases the maximum amount of obsessional symptoms which they could produce may have been reached. This amount was seen to vary evenly in this series, from those patients whose obsessions were minimal and transient, to those with well-developed, long-standing obsessional neurosis. The evidence for the limitation lay firstly in the fact that in the majority of cases, the obsessional symptoms were produced prior to the onset of schizophrenic symptoms, and continued thereafter, secondly, that there was an even range of the number of obsessional varieties produced throughout the series of thirty cases.

It is postulated that the failure of the obsessional symptoms to meet the environmental stresses is due to the individual's limited ability to manifest them, and then schizophrenic symptoms, to which there is a predisposition, are released. It seems that the predisposition to schizophrenia must be very much more frequent among obsessionals than among the general population.

It is interesting to note that certain cases also produced other neurotic symptoms as well as obsessions.

The transition of Obsessions into Delusions: The observations made on six cases support those authors who have stated that transitions from obsessions to delusions do occur. Three possible ways were demonstrated by means of which, either singly or in combination, an idea changed its character.

Depressive Symptoms: It has been pointed out by Stengel (1945) that in obsessional patients who develop schizophrenia, depressive symptoms are frequently present. This has been borne out by this material. In twenty-five out of thirty patients, marked depressive symptoms were present at times. Stengel noted the absence of manic features in his series. This also applied to this case material except perhaps for one case in which hypomanic symptoms were possibly present for a short while. Stengel also pointed out that when obsessional symptoms occurred in a predominantly depressive setting, suicidal and homicidal compulsions could very frequently be observed. Suicidal threats were made by twelve patients of this material, two made suicidal attempts, one committed suicide. Acts of violence and aggression were found in ten cases. Mayer-Gross's observation that obsessions could turn into delusions at the height of depression was seen in one case of this series.

The presence of affective symptoms has been regarded as a good prognostic sign in schizophrenia, and this may be another factor making for a comparatively benign course of schizophrenia in this and comparable series.

Response to Treatment: In assessing the effects of the various treatments employed in these patients, it must be borne in mind that the number of cases is too small to allow of any generalizations. It can be said that the results were unimpressive, and even poor, if one takes into account the natural tendency to spontaneous remission which these patients showed. However, this material does not justify the assumption that these patients were less accessible to treatment than other schizophrenics or obsessionals. The relatively poor effect of leucotomy is in keeping with similar observations in obsessional and schizophrenics.

A wide variety of clinical pictures were found.

The course of the illness was characterized in most cases by a marked tendency to remissions.

It can be said therefore that the group as a whole showed an absence of malignant schizophrenic development. These observations bear out Stengel's contentions, which were corroborated by Müller, that the course of schizophrenia occurring in obsessionals tends to be comparatively benign in type, both with regard to the disintegration of the personality and to the tendency to remissions.

Summary

1. Thirty schizophrenic patients who had obsessional symptoms at some time in their lives were investigated. They formed 3·5 per cent of the total schizophrenic in-patient population of the London postgraduate teaching hospital for psychiatry during a four-year period.

2. In twelve cases the obsessional symptoms had made their first appearance before the age of twenty, and in eleven before the age of thirty-five.

3. None of these patients had received psychiatric attention before the onset of their schizophrenic symptoms although in a considerable proportion obsessional symptoms had been present years previously.

4. In six cases, depression had been the first presenting symptom, while in eight cases obsessional symptoms had preceded any other by a considerable time.

5. In twenty-six of the thirty patients, the schizophrenic condition was of the paranoid type. There was no case of catatonic schizophrenia among this group.

6. The fate of the obsessional symptoms after the onset of the schizophrenia was studied. Transition of obsessional ideas into delusions was observed in six cases.

7. The duration, elaboration and variety of obsessional symptoms appeared to be inversely correlated with the severity of the schizophrenic illness.

8. Symptoms of depression were observed in twenty-five of the thirty schizophrenic patients.

9. There was a marked tendency to remissions in the majority of patients of this series and a conspicuous absence of malignant schizophrenic developments leading to disintegration of the personality.

10. The response to various treatments employed in this group was unimpressive.

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THE RELATIONSHIPS BETWEEN SOME ASPECTS OF VISUAL IMAGERY AND THE ALPHA RHYTHM

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INTRODUCTION

GOLLA, Hutton and Grey Walter (1943) made an attempt to use the EEG as an objective means of assessing imagery. They concluded that there were three types of alpha rhythm which corresponded to three different kinds of imagery processes: M or minus type whose alpha rhythms were almost non-existent and who used mainly visual imagery in thinking; the P or persistent type whose alpha rhythms continue even during mental activity, and who used mainly vocal-kinaesthetic imagery; the R or responsive type with a good resting alpha rhythm which blocked readily during mental activity, and whose imagery was mixed. Though they were attempting to find an objective means of assessing imagery an ultimate appeal is made to introspection as a validating criterion, and the tasks given to the subjects were such as to present difficult problems in the way of introspection. For instance, they were asked to think over to themselves the story of Red Riding Hood, to think over to themselves their plans for some definite day, to think over the argument for and against some abstract proposition such as "honesty is the best policy" or "the existence of free will". It is felt that if an attempt is to be made to find an objective means of assessing imagery some attempt should first of all be made to control the kind of imagery that will be used.

Short (1953) in a report of his investigation came to the same conclusions as the previous workers, but is subject to the same criticism. Short and Walter (1954) in their investigation asked the subjects to outline with their fingers figures made by grooves in cement blocks. Here a stoical attempt to get away from introspection results in findings whose relationships to imagery are very vague.

Drever (1955) recently published some observations on the occipital alpha rhythm recorded from groups of early blind, late blind and sighted subjects during the performance of two spatial tasks. Since the test scores differentiated between the groups it was argued that the performance probably involved a visual component. Here we have a successful attempt to control the kind of imagery likely to be used. He found that when the subjects were classified into the three alpha rhythm types M, P and R, the groups did not differ significantly from one another in terms of test scores. He regarded this as negative evidence in relation to the hypothesis of M, P and R types. Perhaps even more important than this finding however was the finding that the M type which is supposedly associated with predominant visual imagery was found most frequently among the blind. He concluded that the hypothesis tested is too simple and would have to be reformulated to fit the facts.

Barratt (1956) gave his subjects a verbal reasoning problem likely to encourage verbalization in its solution and a task that was likely to encourage visualization. His main finding was that there was a significant suppression of the alpha rhythm during both the verbal reasoning condition and the visual problem condition. There was a greater suppression effect in the case of the "visual" problem but the results as a whole he concludes suggest that visual imagery appears to be only one of many factors that may produce suppression effects.

It appears then that the interpretation to the P, M and R types no longer accounts for all the data, and that there is not a simple relationship between alpha suppression and visualization. On the other hand there does seem to be a relationship between some aspect of visualization and suppression of the alpha rhythm which demands further investigation.

Individual differences have been found in relation to the control and vividness of visual imagery (Gordon, 1950; Petrie, 1952; Costello, 1956), which suggested an investigation into the relationship between the vividness of visual images and suppression of the alpha rhythm. The experiment to be reported here was designed to investigate this relationship.

SUBJECTS

Twenty subjects were investigated. They were members of the nursing staff of St. George's Hospital with one exception, this being a fourth-year medical student. Each subject had been tested one week previously in connection with another investigation the results of which it is hoped to publish elsewhere. The nature of visual images had been discussed with the subjects individually, and they knew exactly what was expected of them. They were asked not to discuss the experiment with their friends, and they did not know the purpose of the experiment beyond the fact that we were interested in changes in the EEG when they were asked to visualize something.

The mean age of the group was 22·1 years, the mean score on the Matrices 47·25. Further data on the group can be found elsewhere.

METHOD

The two main features in the design of this investigation into the relationship between the vividness of visual imagery and alpha suppression were: the subjects were asked to visualize four completely different objects chosen for the expected differences in the vividness of the visual images they would provoke; secondly the subjects were tested in a normal state, and also in a drowsy state induced by a small dose of Seconal. The observations on hypnagogic imagery (McKellar and Simpson, 1954) suggested the possibility that the visualizations in the drowsy state would be more vivid than those in the normal state.

First Normal Session

The experiment was conducted in the EEG Department of St. George's Hospital, Morpeth. The subjects were reassured that they would feel nothing when the record was being taken. The apparatus used was the standard eight-channel Ediswan Mark II EEG, and an Ediswan eight-channel automatic wave analyser. The electrodes were fitted. A bipolar arrangement was used consisting of a chain of three electrodes on each side: Mid-parietal—parietooccipital—occipital areas. The channel analysed was the one showing the maximum alpha amplitude during the eyes closed condition.

The following instructions were then given:

> "During the recording you will have to open and close your eyes a number of times. I want you to listen carefully to the instructions because it is important that you have your eyes open or closed at the right time. Remain relaxed and still throughout the recording and do not say anything unless I ask you a question."

A trial run was then taken consisting of thirty seconds with eyes closed and thirty seconds with eyes open. The purpose of the trial run was to establish a basic maximal measure for each subject with which the measure during visualizing conditions could be compared.

At the end of the trial run the subject was shown a coloured photograph 10 in. × 8 in. of a Ford Consul. He was told to examine it carefully so that afterwards he would be able to get a good picture of it in his mind. After three minutes the photograph was taken from him. He was then told to relax and try to keep his mind a blank except when the experimenter asked him to get a picture of the car. He was then to remain relaxed but to get the best picture he could. The subject was then told to close his eyes and the EEG record commenced. After thirty seconds the subject was told to get a picture of the car. Each visualizing condition was planned to start at the beginning of the analyser's 10-second epoch and was also indicated with an input marker. After thirty seconds the subject was told to forget the picture and after a further ten seconds was told to open his eyes. He was then given a card with the following six possible descriptions of his visual image and told to choose the one that he felt best described his image:

1. Very clear almost like a photograph.
2. Clear with definite shape.
3. Moderately clear with some detail.
4. Not very clear—only a general impression.
5. Very vague—hardly any picture at all.
6. Absent altogether.

After he had done this the subject was shown an abstract diagram for five seconds (see Fig. 1). The subject was told to look at it carefully since he would be shown it for only five seconds and afterwards would be required to get a picture of it.

When the five seconds had elapsed the diagram was taken away. The subject was given the same instructions as before with regard to remaining relaxed and keeping his mind a blank except when visualizing. He was then told to close his eyes, the EEG record was commenced, and the procedure was exactly as before except that this time he was asked to get a picture of the diagram. He was afterwards asked to choose the best description of his picture from the card.

The following instructions were then given to the subject:

> "In a few seconds I will ask you to close your eyes and get a picture of a scene. Try your best to get the picture but remain relaxed. After you have started getting the picture in your mind you will hear a buzzer. This is a signal that a watch is going to be held near your ear. When you hear the buzzer I want you to keep the picture in your mind and at the same time try to listen to the ticking of the watch. A second buzz will be a sign that the watch has been taken away."

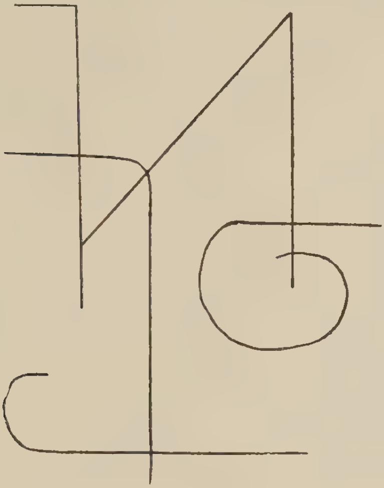

FIG. 1.—The Diagram

The subject was then told to close his eyes and the EEG record was commenced. After thirty seconds he was told to get a picture in his mind of a red United Bus turning into the Morpeth Market Place, stopping, and all the people getting out of it. Thirty seconds later a buzzer was sounded and a watch held near his ear. After a further twenty seconds the buzzer was sounded and the watch taken away. Twenty seconds later the subject was told to open his eyes. He was then asked to choose the best description of his picture from the six descriptions listed, and also to choose the best description of the movement as he saw it from the following five descriptions.

1. Saw the movement clearly.
2. Saw the movement with some effort.
3. Experienced much difficulty in seeing the movement.
4. Almost impossible to see the movement.
5. Could not see the movement.

The subject was then shown a drawing of a wheel with two small figures on it for five seconds (Fig. 2). The subject was told to look at it carefully since he would be shown it for only five seconds and afterwards would be required to get a picture of it.

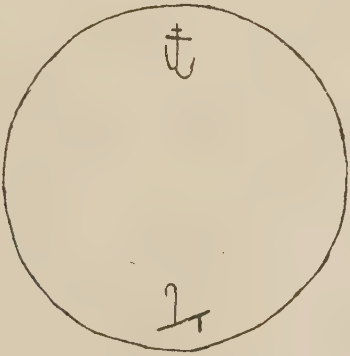

FIG. 2.—The Wheel

After the drawing of the wheel was taken away the following instructions were given to the subject:

> "In a few seconds I will ask you to close your eyes and then I will ask you to get a picture of the wheel with the two figures on it turning round. Try your best to get the picture but remain relaxed. After you have started getting the picture in your mind you will hear a buzzer. This is a signal that a watch is going to be held near your ear. When you hear the buzzer I want you to keep the picture in your mind and at the same time try to listen to the ticking of the watch. A second buzz will be a signal that the watch has been taken away."

The subject was then told to close his eyes and the EEG record was commenced. The procedure was exactly the same as before except that this time he was told to get a picture of the wheel turning round. He was afterwards asked to choose the best description of the clearness of the picture and of the movement from the two cards.

This was the end of the first session and the subject was told when to come back for the second session which was within a week.

Second Seconal Session

About twenty minutes before the recording began the subject was given $2\frac{1}{4}$ gr. Seconal and was left alone lying on the couch. He was told to let himself drift into a pleasant drowsy state but not to go off to sleep. Though there were individual differences in every case, the Seconal produced a drowsy state that was neither too shallow nor too deep for our purposes.

Apart from the administration of Seconal the procedure was exactly the same as in the first session and it will not be repeated here.

RESULTS

The path traced by the automatic analyser was taken as the source of data· The dominant frequency and the two adjacent frequencies within the alpha band (8–13 c/s) were measured for height in millimetres within each 10 sec. epoch and then averaged over the number of epochs occupied during each of the experimental conditions. These three values were then combined to give a single "score" for each individual under each experimental condition. The investigators found (as did Barratt) that the dominant frequency and the two adjacent to it accounted for practically all the variation in amplitude. Each of these "scores" was then converted into a percentage fall from the resting alpha amplitude. This conversion into percentages was done for two reasons.

1. The investigator was interested in alpha suppression rather than absolute alpha amplitude.
2. A percentage rise or fall was not only more meaningful than absolute values but was not influenced by possible fluctuations in the machine's activity or displacement of the electrodes in the second session from the position they had in the first session. On the other hand it should be pointed out that every effort was made to keep everything standard.

The four different periods during which the subject visualized the different objects will be referred to as the "Car Condition", i.e. the period during which the subject was visualizing a car, the "Diagram Condition", the "Bus Condition" and the "Wheel Condition". The periods during which the subject had to visualize the Bus or the Wheel and at the same time listen to the watch will be referred to as the Distraction Condition. The significance of the obtained differences was tested by the statistic "A" which Sandler (1955) has derived from Student's "t" and which yields exactly the same results as "t" but is not so time-consuming.

The results will now be presented in Table form and summarized after each table.

TABLE I

Mean Percentage Fall when the Resting Alpha Amplitude is taken as the Baseline, Raw Differences between Means and A and p Values for the Differences between the Means for the Distribution of Percentages obtained under the Four Visualizing Conditions during the First Normal Session taken two at a time (n=20)

Comparison	Mean	Mean	Difference	A	p
Car *vs.* Diagram	−42·35	−33·15	−9·2	·167	<·02
Car *vs.* Wheel	−42·35	−38·8	−3·05	3·287	>·10
Car *vs.* Bus	−42·35	−30·1	−12·25	·275	>·05
Diagram *vs.* Wheel	−33·15	−38·8	−5·3	·961	>·10
Diagram *vs.* Bus	−33·15	−30·1	−3·0	1·261	>·10
Wheel *vs.* Bus	−38·8	−30·1	−8·7	·264	<·05

From the data in Table I we can conclude that:

1. There is a significantly greater suppression effect on alpha amplitudes in the case of the Car Condition than in the case of the Diagram Condition.
2. The differences between the Car Condition and the Wheel Condition, between the Car Condition and the Bus Condition, between the Diagram Condition and the Wheel Condition and between the Diagram Condition and the Bus Condition are not significant.
3. There is a significantly greater suppression effect in the case of the Wheel Condition than in the case of the Bus Condition.

The experiment was designed with the assumption that the picture of the car would provoke a more vivid image than the diagram. The difference between the two pictures objectively was such that it was felt that the comparison of the vividness of the images provoked would not tax the subject's ability to introspect. The simple method of asking the subject to choose the appropriate description of his image from the six presented seemed to be a sufficient test of the assumption. Seventeen of the twenty subjects chose descriptions from the card indicating clearly that they had a much more vivid image of the Car than of the Diagram. Two of the subjects chose the same description for the Car and Diagram and only one subject chose descriptions suggesting a more vivid picture of the Diagram than of the Car. The significantly greater suppression of the alpha rhythm during the Car Condition with the large agreement between the subjects that it was the stronger image lends support to the hypothesis that there is a relationship between the vividness of a visual image and the amount of suppression.

It was also expected that the request to get a picture of the Bus scene—a scene familiar to all the subjects—would provoke a more vivid image than the Wheel. Fifteen of the subjects chose descriptions indicating that the Bus scene was more vivid than the Wheel, five chose the same description for Bus and Wheel. But here we have a greater suppression under the "Wheel Condition"! The results seem to be contradictory. A possible explanation of this discrepancy will be presented during the overall discussion of the results.

TABLE II

Mean Percentage Fall when the Resting Alpha Amplitude is taken as the Baseline, Raw Differences between Means and A and p Values for Differences between the Means for the Distribution of Percentages obtained for the Four Visualizing Conditions during the First Normal Session and the Second Seconal Session ($N=20$)

Condition	1st Session Mean	2nd Session Mean	Difference	A	p
Car	−42·35	−37·55	−4·8	1·467	>·1
Diagram ..	−33·15	−35·8	−2·7	5·319	>·10
Bus	−30·1	−40·95	−10·85	·243	<·05
Wheel	−38·8	−42·45	−3·65	2·822	>·10

From the data in Table II we can conclude that the difference between the two sessions for the Car, Diagram and Wheel conditions are not significant but the difference is significant for the Bus Condition. It was expected that under Seconal the imagery would be more vivid but there are no clear-cut differences between the two sessions for any of the conditions or at least none that appeared in their choice of descriptions with respect to the vividness and the movement of the images. What is noteworthy however, is that five of the subjects said the Bus scene came more easily and two of these subjects reported images associated with the scene they were trying to visualize, but which they had not actually tried to get. One subject said she had a clear picture of her husband driving the Bus, a second subject said that after the Bus he had visualized had come into the Market Place, other buses started coming in. Further discussion of the significance of this will be postponed until the remainder of the data has been presented.

TABLE III

Mean Percentage Fall when the Resting Alpha Amplitude is taken as the Baseline, Raw Differences between Means and the A and p Values for the Differences between the Means for the Distribution of Percentages obtained under the "Bus Condition" and "Wheel Condition" and their Two Distraction Conditions during the Normal Session and the Seconal Session ($n=20$)

Comparison	Mean	Mean	Difference	A	p
Bus *vs.* Distraction (1st Session) ..	−30·1	−34·3	−4·2	1·174	>·10
Wheel *vs.* Distraction (1st Session)	−38·8	−30·75	−8·05	·440	>·10
Bus *vs.* Distraction (2nd Session) ..	−40·9	−21·05	−19·9	·185	<·02
Wheel *vs.* Distraction (2nd Session)	−42·45	−18·1	−24·35	·109	<·001

It should be noticed that the amplitudes being expressed as a percentage fall from the resting alpha amplitude the means for both the visualizing and distraction conditions are minus values. When the percentage for the distraction condition is smaller than that for the visualizing condition this indicates a rise from the alpha amplitude during the visualizing condition. For instance −40 per cent. for the Bus Condition −20 per cent. for the Distraction Condition would mean that the Bus Condition amplitude was 40 per cent. lower than the resting alpha and the Distraction Condition alpha 20 per cent. lower than the resting alpha.

It can be concluded from the data in Table III that there was a significantly greater rise in alpha amplitude during the Distraction Condition for the Seconal Session than for the Normal Session. This Distraction test followed of course Adrian's test where he found that with subjects whose eyes were open there was a greater rise in alpha amplitude when listening to a watch when the subjects wore lenses which blurred the visual field and therefore gained the attention less. It would seem then that under Seconal the visual images gained the attention less. This follows from Adrian's explanation but is supported also by the reports of the subject of this experiment who said that the images under Seconal came more easily. Some of the subjects also reported spontaneously that they were not concentrating so much during the Seconal Session as they were during the Normal Session.

Discussion and Conclusion

The most important finding of the experiment is that suppression of the alpha amplitude varies with different types of visual images and under different conditions. Suppression of the alpha rhythm it would seem is not an all or none effect.

The difference in suppression under the Car Condition and the Diagram Condition suggests that there is a relationship between the vividness of the image and alpha suppression such that the more vivid the image the greater the suppression. It is suggested elsewhere that the vividness of visual images may be related to cortical inhibitory and excitatory processes. Gastaut (1957) has discussed his experiment on conditioning of the alpha in terms of cortical excitation and inhibition. It seems likely that the EEG will play a useful role in the investigation of these cortical processes. The result with the Bus Condition and the Wheel Condition on the other hand suggests that there may be other factors of importance apart from the vividness of the image and that these factors, despite the vividness of the image, may produce the opposite effect. In the face of this problem the first question that comes to mind is in what way does the Bus Condition differ from the other conditions? There are a number of important ways. First of all, in all the other conditions the subjects were shown a picture or drawing of the thing they had to visualize. Secondly, and this follows from the first difference, the subjects had more freedom to visualize as they wished and this meant, thirdly, that the visual images were less of a fixed kind than the other images. Fourthly, the other three conditions may be regarded as more pure visualizing situations in the sense that they had a specific thing which they had seen to visualize and which were not of the kind readily to provoke associations of a non-visual kind. In the case of the Bus Condition there was ample room for the provocation of associations and in one sense it may be true to say that they had to think about the scene in order to visualize it whereas in the other conditions the object came ready made. It will be seen that this fourth difference may be the crucial one.

It was noted before that some of the subjects reported that the visualizing of the Bus in the Seconal Session was more easy. This suggests that they were not concentrating so much, which follows from the known sedative effects of Seconal. We have also the findings in this experiment indicating clearly that the subjects were more easily distracted during the Seconal Session.

This being one of the first attempts to investigate a difficult area of psychological and electrophysiological relationships the significant findings are few and one must beware of building a too heavy theoretical superstructure on them. On the other hand some attempt should be made to provide an explanation for the results if only to suggest hypotheses that can be tested in the future.

It is hypothesized that the amount of suppression of the alpha rhythm is a result of at least two factors. First of all the vividness of the image, secondly the extent to which thought, associations or what we may collectively call the higher thought process, are involved. If this is the case, then, although the Car suppressed the alpha rhythm more than the diagram did because it was a more vivid image the Wheel suppressed the alpha rhythm more so than the Bus, although the Bus was more vivid because the Bus involved higher process more. The examination we made of the differences between the Bus and the other objects to be visualized suggests that this explanation is at least a plausible one. Again, if the hypothesis is correct then it would seem that the greater suppression during the Bus Condition in the Seconal Session is a result of the inhibition of the higher processes by the Seconal, thus resulting in what we have called a more pure visualizing condition and so in a greater suppression. The greater ease with which the Bus scene was visualized during Seconal and the greater distractability fit in with this explanation.

The basic assumption made in the explanation is that the higher processes have an inhibitory effect on the visual processes—the visual processes being released from this inhibition in the drowsy state due to inhibition of the higher processes. Piaget has written that "whenever there is symbolism in dreams, in the images of the half sleeping state, or in children's play it is because thought in its state of low psychological tension or in its elementary stages, proceeds by egocentric assimilation and not by logical concepts" (1951). Psychoanalysts talk of representation of wishes in dreams when the superego is relaxed. Rorschach workers associate more vivid and revealing projections with a release of ego control (1954). The explanation proposed fits in with the positions held by these workers in different fields of study.

The main contribution of this work is to show that a study of the relationships between aspects of imagery and EEG changes is a worthy area of research, and may be more fruitful from the point of view of dimensions of personality or thought processes than attempts to classify people as visualists, verbalists, etc. Secondly, by varying the stimulus conditions and with the use of drugs during the recording of EEG activity it may be possible to throw light on hypnagogic imagery, dreams and related visual phenomena. The relationships between the inhibitory effect of the higher processes, the inhibitory effect of drugs and the general state of reactive inhibition would seem to be an important area for research. It would be tempting to speculate further on these inter-relationships in the case of visual hallucinations, particularly in view of the fact that there is considerable evidence suggesting increased cortical inhibition after brain injury (Klein and Krech, 1952; Petrie, 1952; Hildebrand, 1953), but we have gone far enough with the data available.

SUMMARY

1. EEG records were taken from twenty normal subjects during two sessions. For Session I the subjects were in a normal relaxed condition. For Session II they were in a drowsy state induced by 2½ gr. Seconal.

2. During both sessions they were asked to get visual images of a Car (previously seen), a Diagram (previously seen), a Bus scene (described to them) and a Wheel (previously seen).

3. When they were visualizing the Bus and when they were visualizing the Wheel a watch was held near their ears for a short time in an attempt to assess their distractability.

4. An analysis of the data suggests that the amount of alpha suppression is related to at least two factors: (1) The vividness of the visual image—the more vivid the image the greater the suppression; (2) The extent to which the higher thought processes are involved—the less they are involved the greater the suppression.

5. The general significance of the results is discussed.

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AN EXPERIMENTAL STUDY OF LEARNING AND "MEMORY FUNCTION" IN ELDERLY PSYCHIATRIC PATIENTS

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A PAPER by Shapiro, Post, Lofving, and Inglis (12) has reported on the relationship of certain aspects of mental functioning to the psychiatric illnesses of old age. This study confirmed that performance on some tasks which appeared to involve "memory function" is relatively more impaired in elderly patients with organic brain pathology than in elderly patients with functional psychiatric disorders. It was also shown, however, that the difference between functional and organic groups on these memory tests was not as great as might be expected on the basis of the commonly held psychiatric hypothesis that memory disorder is one of the leading features of early cerebral involvement in old age. The relatively poorer performance on these memory tests of the organic patients could not be accounted for in terms of, for example, lower intelligence, since the memory tests produced significant differences between the organic and functional groups whereas the intelligence tests did not. A process of correlational analysis (Inglis, Shapiro, and Post (8)) showed that these tests did seem to have some psychological function in common which could usefully be labelled "memory".

It should be emphasized that the first study quoted above was mainly concerned with diagnostic problems while the present paper is concerned with the investigation of memory disorder as such. It is a matter of common observation and concern that many old people suffer from "failing memory" and it is considered that the nature of such dysfunction deserves investigation in its own right, divorced from diagnostic considerations. The present study represents an attempt to make such an examination.

METHOD

Subjects

The individuals tested consisted of an experimental group of eight elderly patients clinically estimated to be suffering from undoubted memory disorder. This estimation was done by the consultant psychiatrist in charge of the cases (Dr. Felix Post) on the basis of a full psychiatric investigation of each patient. The main elements in this investigation relevant to the assessment of memory disorder were (*i*) if the patient himself complained of failing memory, (*ii*) if any evidence emerged on examination that the patient's memory was impaired: for example, if he could not remember the name of the hospital or his doctor's name, and (*iii*) if relatives complained about the patient's memory; for example, if the patient forgot errands or frequently lost his whereabouts.

A control group of another eight patients without memory disorder was also tested. Each of these was closely matched with a member of the experimental group in terms of chronological age and also in terms of Verbal Scale

Weighted Score as obtained from the Wechsler Bellevue intelligence test (Wechsler (13)). There were three men and five women in each group, all being patients of the geriatric unit of the Bethlem Royal Hospital. All the patients were co-operative during testing and none suffered from any sensory defect so severe as to interfere with test performance.

Variables

The functions subsumed under the concept of memory are regarded by the present writer as a part of the study of human learning in general. As McGeogh and Irion point out (9, p. 6), "It has long been customary to divide the field into two main parts, 'learning' or fixation, and 'retention'. At the level of logical analysis this division is clear because an act must be fixated before it can be retained. In the learning of complex acts by continued practice, however, our measurements do not often separate fixation from retention, and the two are intermingled in each practice trial after the first. For the sake of convenience, the distinction between learning and retention has been given a different meaning from the logically analytic one, *learning* being used to designate the acquisition of changes in behaviour during a specified time or to a certain level, and *retention* being used to mean any measured persistence of these changes after practice ceases."

It should be noted, however, that neither the common nor the clinical use of the term memory usually differentiates explicitly between such phases. Usually most attention has implicitly been paid to the retention stage. It was therefore thought necessary, in the present study, to use tests which could in principle give some measure of these different phases in as simple and as objective a way as possible. It also seemed desirable that the effects of different interests and of previous experience should be reduced to a minimum, and that the testing procedure should be as brief and as constant as possible. The method that seemed to meet these criteria most satisfactorily was the method of paired associates.

Paired Associate Learning Tests

In using this technique it was necessary to take into account possible differences which might arise in different learning modalities (e.g., auditory/visual) or from different modes of reproduction (e.g., recognition/recall). The following subtests were therefore devised.

Auditory Recall—In this subtest the patient had to learn to associate three pairs of words auditorily presented (cabbage–pen; knife–chimney; sponge–trumpet). The examiner first read the list of words two at a time, at the same time asking the patient to remember which words went together. After this presentation the examiner then read the stimulus words to the patient, one by one in random order. The patient then had to recall which response word went with each stimulus word. If the patient could not give the response within ten seconds, or gave the wrong one, the correct word was read to him by the examiner. If the patient gave the right answer this was acknowledged and the next stimulus was given.

The criteria according to which this subtest and the other paired associate subtests were scored, are discussed under "*Results*" below.

Visual Recall— In this subtest the three pairs of stimuli to be learned were simple drawings on cards (candle–cup; book–brush; spectacles–jug). The method of administration was the same as in the Auditory Recall subtest except that for the first presentation the cards were shown in pairs from behind a screen.

The patient could not always be prevented from calling out the name of the object shown in this way, but this was avoided as far as possible. After the first presentation the patient was required to give the name of the response object on being presented with the stimulus card alone. Prompting was done by showing the correct response card.

Auditory Recognition—In this subtest the subject had to learn to associate another three pairs of words (flower–spark; table–river; bottle–combe) auditorily presented, exactly as in the Auditory Recall test. Instead, however, of having to recall the correct response word as each stimulus word was read by the tester, the patient had to choose the correct word from the list of three responses as these were read aloud in random order by the examiner. Failures and wrong responses were corrected verbally.

Visual Recognition—This subtest resembled the Auditory Recognition subtest except that the stimuli were again presented drawn on cards (pipe–umbrella; tap–axe; pencil–key). After the initial demonstration the subject had to recognize the correct response card out of the set of three which the examiner showed one at a time in random order after each stimulus presentation. Wrong responses and failures were corrected by the subject being shown the correct card.

Digit Span Tests—This type of test is often used clinically as a "memory test", although some authors have denied that it tests any such function (Hopkins and Roth (7)). In order to test the merits of these different views the following items were included.

(*i*) The first measure was provided by the Wechsler Digit Span forward items which, of course, require auditory presentation and verbal recall.

(*ii*) The second measure, like the third and fourth below, was an adaptation of the Knox Cube Digit Span Test. In this item the digit series was tapped out by the examiner on four cubes. The subject was required to tap the series back. This method involved visual presentation and manipulative recall.

(*iii*) In this third subtest the subject was told to think of the cubes as being numbered from one to four and was coached in this notion until he had grasped it adequately. The digit series was then tapped out by the examiner and had to be recalled verbally by the subject. This method therefore involved visual presentation and verbal recall.

(*iv*) Fourthly, the examiner read out the series and the subject had to tap out his answer on the cubes. This test involved auditory presentation and manipulative recall.

RESULTS

The means and standard deviations of each variable for the experimental and control groups are shown in Table I. The significance of the differences between the group means for each variable was estimated by Sandler's A test (11). It has already been pointed out that the two groups were composed by the method of matched pairs. An advantage of this method, according to Dixon and Massey (5) is that we need not assume equality of variance on the variables being examined, so that for the purpose of this analysis any differences in variance have been disregarded.

1. AGE:

Since the groups were matched in age they were not, of course, significantly different on this variable. The initial matching was done in such a way that the control subject chosen would always be, if anything, slightly older than the paired experimental subject. This explains the slightly, but not significantly, higher mean age of the control group.

TABLE I

		Variable	Experimental		Control		A	P
			m	σ	m	σ		
		Age	65·75	8·19	67·25	7·17	0·306	NS
Wechsler		VSWS	33·88	8·90	30·50	8·42	0·284	NS
		PSWS	13·50	13·77	26·50	9·75	0·305	NS
		VS-PSWS	20·38	13·53	4·00	9·97	0·223	·05–·02
		FSWS	47·38	18·84	57·00	15·25	0·538	NS
Paired Associate Learning Tests	a	Aud. Recall	59·25	23·60	14·13	4·55	0·150	<·001
		Vis. Recall	50·25	29·20	6·63	3·70	0·169	·01–·001
		Aud. Recog.	51·88	29·61	7·50	3·42	0·174	·01–·001
		Vis. Recog.	35·38	22·59	6·00	2·51	0·185	·01–·001
	b	Aud. Recall	1·50	1·42	3·00	0·00	0·222	·02
		Vis. Recall	1·88	1·36	3·00	0·00	0·284	NS
		Aud. Recog.	1·75	1·49	3·00	0·00	0·280	·05–·02
		Vis. Recog.	2·13	1·25	3·00	0·00	0·347	NS
Digit Span		Aud.-Verb.	5·50	0·76	5·75	0·89	1·000	NS
		Vis.-Man.	4·38	0·92	4·25	0·46	9·000	NS
		Vis.-Verb.	3·63	1·60	4·13	1·36	1·250	NS
		Aud.-Man.	4·38	1·06	5·25	0·46	0·265	·05–·02

2. INTELLIGENCE:

Verbal Scale Weighted Score—Since the subjects were paired on this variable also, no significant difference emerges. The matching on this variable was done so that, if anything, the control subject would obtain a slightly lower score than the paired experimental subject and this tendency is reflected in the means.

Performance Scale Weighted Score—The difference between the means is not significant on this variable but an interesting trend is reflected in the direction of the difference. Although the pairs were chosen as described on the Verbal Scale score the difference between the groups on the Performance Scale goes, if anything, in the *other* direction; that is to say the experimental group, on the average seems to get a lower score on the Performance Scale than the control group.

Verbal minus Performance Scale Weighted Score—In order to find out if this last observation represented a reliable tendency the mean difference Verbal minus Performance was tested and found to be significant. When initial difference in intellectual level is held constant, then elderly patients with memory disorder tend to get much lower Performance than Verbal Scale Weighted Scores as compared with patients without memory disorder. The psychological significance of this finding will be discussed later.

Full Scale Weighted Score—The difference as between the means on this measure was not significant.

3. PAIRED ASSOCIATE LEARNING TESTS:

Although it is possible, in principle, to obtain scores for both acquisition and retention on this kind of test; in practice, on this occasion, it did not prove feasible to obtain measures of both these aspects of learning. Scores of acquisition alone were obtained because no test was simple enough to enable all the subjects to learn the required criterion. Unless such a common criterion is reached then strict comparisons between individuals as to the amount they retain is impossible.

The following results, concerned with acquisition, were obtained:

(a) *The number of trials to acquire the associates to a criterion.* In each subtest the subject had to learn to associate the three pairs of stimuli to a criterion of three consecutive correct responses for each pair. If the subject failed to learn them all correctly to this criterion the test was stopped after thirty repetitions of each pair. Thus the maximum score on each subtest was 93 (thirty repetitions of each pair plus the first presentation in each case), and the minimum score was three (i.e., if the subject learned perfectly on the first presentation of each pair).

Each of the subtests showed very significant differences between the groups, that is to say, the experimental group required very many more trials to learn. There is thus shown a definite connection between the number of trials taken to learn pairs of stimuli to a criterion and the clinical impression of memory disorder. It can therefore be concluded that a defect in the first stage or phase of learning (i.e., a defect of acquisition) is an important element in memory disorder in elderly psychiatric patients.

(b) *The number of items learned to the criterion.* This second score consists simply of the number of items actually learned to the criterion within each subtest. Since each subtest consists of three items the maximum score, which is, in this case, the "best" score, is three, and the minimum, or "worst" score is 0.

Although there are no uniformly significant differences between the groups, nevertheless interesting results do emerge. For example, in the case of the control group no one failed to learn each pair to the required criterion, therefore in this group there is no variance on this measure. Individual differences in the number learned were, however, shown in the experimental group.

For neither of these measures, (a) or (b), does sensory modality of presentation, or method of reproduction, seem to make much difference.

4. Digit Span Tests:

The score on each item in this group was the longest digit series repeated without error.

On the basis of the results obtained it can be stated that this kind of test is not related to any function relevant to differences in memory in elderly patients. Only one of the four subtests shows a significant difference between the groups and this at a low level of confidence.

This finding runs counter to a common clinical practice which regards such items as "tests of immediate memory".

This conclusion is, of course, in accord with the opinion expressed by Hopkins and Roth (7), and also with the clinical findings of Zangwill (14) who found that patients with marked memory defect can show quite large "memory span" on digit tests, but that such patients may nevertheless fail to *acquire* an only slightly longer digit series than the one which they successfully reproduced at first trial attempt.

The results of the present study, concerning these digit span tests, are of additional interest in so far as they help to rule out the notion that the patients in the experimental group might have suffered from a greater incidence of peripheral difficulty which might have handicapped them in the learning tasks.

DISCUSSION

Two main findings emerge from this study.

Firstly, that patients suffering from "memory disorder" have a marked disability in the acquisition phase of learning paired associates. This finding may, in part, explain "Ribot's law of regression" as applied to elderly people with memory disorder. Thus, recent events are simply not learned (i.e., acquired) by such individuals while remote events, on the other hand, are more available simply because they were, at one time, more efficiently acquired. The approach used in this study permits the operational analysis of clinical impressions and provides a method for examining memory deficit in an objective, quantifiable way, relatively independent of the subject's past experience.

The second main finding in this study is that elderly patients with memory disorder show a large discrepancy between their results on the Performance and the Verbal Scale of the Wechsler.

The relationship between these two findings was examined further by running rank correlations (rho) (McNemar (10)) between Verbal minus Performance scores and the trials to acquisition scores on each of the four paired associate learning subtests. These correlations are shown in Table II.

TABLE II

	Experimental				Control			
	Aud. Recall	Vis. Recall	Aud. Recog.	Vis. Recog.	Aud. Recall	Vis. Recall	Aud. Recog.	Vis. Recog.
VS-PSWS	+0·83xx	+0·66	+0·71xx	+0·85xx	+0·55	+0·19	+0·50	+0·05

xx ρ (rho) significant at 1 per cent. level of confidence.

The correlations within the experimental group show a large positive relationship between the Wechsler difference scores and the learning trial scores while no such relationship is shown in the case of the control group. There is very little variance on the learning tasks in the control group and hence no covariance of these tasks with the discrepancy scores in that group. A possible explanation of the differences in correlation may be that the learning tests were too easy for the individuals without memory defect and variance might be obtained in this group on these tasks, and hence perhaps covariance with the discrepancy scores, by making the learning tests longer.

In attempting to relate the findings of the present study to other work in the field it is of interest to consider them in relation to Cattell's discussion of what he has called "fluid ability" and "crystallized ability". In drawing a distinction between these two kinds of adult mental capacity this author has noted (3, p. 178) that, "Fluid ability has the character of a purely general ability to discriminate and perceive relations between any fundaments new or old. It increases until adolescence and then slowly declines. . . Crystallized ability consists of discriminatory habits long established in a particular field, originally through the operation of fluid ability, but no longer requiring insightful perception for their successful operation. Intelligence tests test at all ages the combined resultants of fluid and crystallized ability, but in childhood the first is predominant whereas in adult life, owing to the recession of fluid ability, the peaks of performance are determined by the crystallized abilities."

M. Davies Eysenck has also used this distinction between the two types of ability in her studies of mental organization in senility. In one study (6) she factor analysed the test performance of a group of senile dementia patients and found that the kind of deterioration from which they were suffering affected most strongly tests involving abstract reasoning ability (i.e., fluid ability) and affected least tests involving a mere reactivation of past experience and knowledge (i.e., crystallized ability).

Thus, for any individual, a problem-solving situation, such as intelligence test, can be thought of as involving both components which require the "running off" of old habits, and others which require completely new kinds of solution-responses.

It may be suggested that, for most elderly people, the two scales of the Wechsler may differentially involve these two types of ability. In responding on the Verbal Scale, for example in defining words, the subject is exhibiting his achievement on "old learning". In the case of the Performance Scale, on the other hand, the material is much less familiar and many more novel response patterns have to be initiated. This view is consonant with the findings of Botwinick and Birren (1) which show that, although the amount of decline in a Wechsler subtest with age is not necessarily a criterion of its ability to differentiate between control and senile deteriorated populations, nevertheless the absolute level achieved by either group is relatively higher in the case of the Verbal Scale average than in the case of the Performance Scale average (Controls: Verbal Scale mean, 7·26; Performance Scale mean, 6·19. Seniles: Verbal Scale mean, 5·61; Performance Scale mean, 3·54).

Bromley (2) has reported a study in which he used the Shaw test with elderly subjects. This study produced evidence that tests of this type (i.e., involving "sorting") may measure "fluid ability". A connection between this type of test and the Wechsler had previously been shown by Cleveland and Dysinger (4). These authors tried to relate certain qualitative aspects of senile deterioration, as estimated by performance on the Goldstein Object Sorting Test, to results on the Wechsler. They showed that, in fact, a low or zero score on the Performance Scale of the Wechsler together with a much higher score on the Verbal Scale was accompanied by an inability to handle the type of abstractions necessary for success on the Object Sorting Test.

It may be, therefore, that the so-called "abstraction ability" involved in tests requiring novel solutions are related to each other. The findings of the present study suggest that these may, in turn, be dependent upon, or at least related to, "new learning ability". This relationship is being explored in a further investigation.

CONCLUSIONS

1. It has been shown that certain elderly psychiatric patients clinically assessed as suffering from some disorder of memory have great difficulty in the acquisition stage of learning paired associates.

2. It has also been shown that such patients produce a larger mean discrepancy between the Verbal and Performance Scales of the Wechsler than do a group of controls. For the experimental group the size of this discrepancy is related to the amount of the learning difficulty.

3. It therefore appears that the connection between learning ability and impairment, "abstract ability" and "fluid ability" may prove a fruitful area of experimentation in the attempt to investigate the behavioural correlates of memory disorder. Further experiments in this area are now in progress.

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Dr. R. W. Payne, in an unpublished series of case studies, has made observations similar to these findings on patients suffering from Korsakoff's syndrome.

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MODERN PSYCHOTHERAPY—150 YEARS AGO*

By

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PSYCHOTHERAPY and what we understand by it today is commonly considered as entirely a product of the last fifty years of psychological and psychiatric development. The psychiatry of the past century is looked upon as a savage and uncultivated field which does not appear to warrant any attention. In a previously published paper† I pointed out the strange contradictory development which the field of psychiatry has undergone during the past two hundred years, interchanging material-physicological periods with those primarily psychological. Each period has violently rejected the previous one and with it the total earlier development. This explains why the earlier development seems to be so completely forgotten. Only a few names are known which are pointed upon as forerunners, but no one has seriously attempted to go back over the last contradictory period into the preceding one with a similar basic attitude, for instance the psychologistical period of the first quarter of the past century. This should be of considerable interest to the psychological period we have been experiencing during the past decades.

Historical studies in psychiatry have been rare and the few we can point to have been done within the limited view of a certain school and do show the growth and development of its dogmatic contents. Real critical, objective historical work cannot follow this narrow and prejudiced road. We should approach these earlier periods and their achievements not with a view to whether they show signs of a development towards Freud, Jung, Adler or whoever else one may consider as the most important representative of the art of helping the mentally and psychologically deranged. Although we are all apt to be limited in some aspects of our thinking, we can find in ourselves some common denominators of basic scientific attitudes which allow objective reports about viewpoints and meanings opposite our own. Only in this way will we be able to view entire developments of a scientific field, such as psychiatry.

In a number of papers I published in recent years, I have not only attempted to trace certain main lines of development in psychiatric pathology and therapy over a longer period of time, but also the actual beginnings of certain methodological features we consider important today.

With this paper I wish to add to these attempts by showing how much, for instance, the psychological-psychiatric period around 1800 had already envisioned certain modern aspects and had even gone beyond our own methods in the specialty of psychotherapy.

Kirchhoff's *Deutsche Irrenaertze* (still the best bibliographical source we have on middle-European psychiatry) designated Johann Christian Reil as being "The conscious discoverer and founder of rational psychotherapy". Reil lived from 1759 to 1813. During the mature decades of his life he was professor of psychiatry at the middle-German university of Halle. Three years before his death he was called to the University of Berlin.

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* Some Abstracts from Johann Christian Reil's *Rhapsodien Ueber die Anwendung der psychischen Cur-Methoden auf Geisteszerruettungen*—1803.

† Ernest Harms: "Consolidation of the Science of Psychiatry Through Historical Studies", *Diseases of the Nervous System*, August 1957.

In 1803 Reil published his major work which he entitled *Rhapsodien ueber die Anwendung der psychischen Cur-Methoden auf Geisteszerruettungen* (Rhapsodies on the application of psychological methods of treatment to mental disorders). This remarkable title was given to a book which even for those days was written in an unusual way and introduced us to a unique temperament, mixing unrestrained radicalism with ingenuous aspects, heart-warming wisdom and even humour. The Rhapsodies are neither a programme-book nor a text with systematic presentation, but rather a work in which the author ten years before his death summed up his life experiences, though he died at the early age of 53.

At the time of its appearance the book received great attention from his friends and followers, as well as from his opponents. For instance, Heinroth criticized him severely but could not avoid mentioning him regularly. Even the controversial school of somatic psychiatry could not fail to acknowledge him as one of the most important early psychiatrists.

In the following pages I wish to reprint a set of passages from the Rhapsodies, selected from the viewpoint that they express certain therapeutic aspects which today are considered as most modern and achievements of the most recent period. One will have to agree that these passages could have been taken from books published yesterday, expressing viewpoints which have a vision even far beyond our present achievements and aims.

To appreciate the proper aspect of the character of Reil's Rhapsodies, I would like to reprint here the first paragraph from his Introduction. One will easily realize the difference from the ethical and religious approach to the task of helping the insane with which Benjamin Rush opened his "Inquiries" when he speaks of the "Consecrated ground" upon which one steps in entering a mental institution. In contrast, Reil's thinking is actually realistic and modern: "One is overcome by a strange sensation if out of the throng of a large city one suddenly enters its insane institution. One is presented here with the appearance of a stage-show of all of what one has encountered outside. There are the scoundrels, the swindlers, tyrants, slaves, criminals and defenceless sufferers, the fools who laugh without reason and the fools who torture themselves without reason. False pride, egotism, vanity and avarice and all the other idols of human weakness hold on this small pond the rudder of life just as they do on the ocean of the big world. However, these odd people of Bicêtre and Bedlam are more open and harmless than those in the big foolhouses of the world. The vindictive demands that fire shall fall from the sky, and the imaginary conqueror who believes in his paranoid mind that he could destroy half the earth with his own sword. . . . However, nowhere do we find smoking ruins of destroyed villages and no people whimper because of afflicted wounds. . . ."

Let us start with what Reil has to say about diagnostic and experimental aspects in psychotherapy. We must remember that experimentation in psychology did not start before 1840 and that application of perceptive and sense-psychology in the abnormal field did not occur until about 25 years later.

"The foremost senses are touch, sight and sound, smell and taste, and provide us less with clear impressions but more with mere sensations. They belong to another group of psychotherapeutic means. However, I believe that at least with the organ of smell, with the aid of a well-arranged set of perfumes, one could conduct certain worthwhile experiments and, by exercising the psyche in learning, distinguish smells and further develop its range and sensitivity of perception. Touch is an important element in psychotherapy. We may have to develop and train the experience of smooth and rough, cold and warm, light and heavy in their various forms. At times when one wants to exercise this sense, one has to exclude all other activities so that concentration is possible. For instance, one could bring the patient into a dark, sound-proof room, filled with various objects, fixed or moving, dead or alive. With some patients one could call for scary sensations. Other patients who are sensitive, should have objects selected so that fear could be avoided. . . .

"We have various boxes for each of the senses containing a number of objects of various sizes and kind, natural as well as artificial things. From this collection a set can be selected for an exercise, according to the abilities and needs of the individual patient. The patient is induced to name each object and point out its major or specific characteristics which he has to combine into a description of the object, which we induce him to put in writing. We give him building blocks which he has to arrange according to given instructions. Or we give him a picture of a landscape cut up into a jigsaw puzzle which he has to put together. In the beginning he is supervised in this activity. Later he is induced to perform these exercises alone and finally he has to memorize these activities. In this way we are able to re-educate the imagination of the patient and his relationships to reality. During the time a patient is knitted to reality by such activity, his sick phantasy is put out of action."

The Swiss-French neurologist, Tissot, was the first to formulate the applicability and psychotherapeutic value of music. However, no one before or long after Reil has expressed such a mature insight into the use and validity of music-psychotherapy:

"The ear is the sense organ which we are least able to close to outside impressions. It is therapeutically of such great importance because of the amount of pleasantness and unpleasantness it can mediate from the total world. It is also the receptor of the spoken word, the major communication system of our mental relations. Pure tonal experience in its pleasant as well as in its unpleasant form can have therapeutic value. Loud and piercing noises may shake a paranoid patient. Water drops dripping from a water faucet have been found to induce a peaceful attention in a patient, leading to peaceful sleep. Music has its therapeutic effect through its rhythm as well as its melody. This effect is much more intense since it is not perceived like speech and poetry by an application of the mind, but directly affects feelings and emotions. Therefore it enters more easily into the depth of the psyche where other means do not reach. Music can calm the storms in our soul. It can chase away depressions and melancholic tendencies. It has a calming effect even upon cases of greatest restlessness. It has proven especially helpful in all cases of depressive states. In paranoid and manic states it may help to divert the strive towards unreality. It is exceptionally helpful during convalescence and as a form of occupational therapy, also to distract, to entertain, and strengthen the mind of the mentally ill." Reil was convinced that for different psychopathological states music-therapy should be specially adapted and he called for research to determine what instrument and what scores should be applied to different mental ailments. This problem has not yet been satisfactorily solved in our days.

One of the most amazing foresights of specific modern psychotherapeutic techniques of Reil are his views of what we call today psychodramatics. He writes: "Each mental institution ought to have a specially arranged theatre with the necessary machinery to present various settings. The employees of the institutions should be trained to play various roles—that of a judge, an executor, physician or an angel who comes from heaven, or the dead who has risen from his grave—all concepts which might play a serious role in the mental status of this or that patient and what might impress his imagination therapeutically. Such a theatre should be able to present scenes from a prison, the lion's den, a place of execution, and an operating room. There would be Don Quixote knighted, imaginary pregnant women freed from their load, fools skinned, repenting sinners absolved in a ceremonial play. In short, such a therapeutic theatre could aid individual cases in a variety of diseases, awaken the phantasy and the speculation, call for the most contradictory emotions, such as fear, fright, astonishment, anxiety or mental calm, according to what may help the patient to eliminate his fixed ideas or his misdirected emotions."

Reil adds: "Why could there not be written real plays for the purpose of the work with mental patients, to be performed by the patients themselves. Some may be acting and some watching. The roles would be distributed according to the individual therapeutic needs. The fool, for instance, could be given a role making him aware of the foolishness of his way of behaving, and so on."

Hardly anything has been considered as important in modern psychotherapy as the field of *Occupational Therapy*. It is regarded as one of our most modern achievements. Let us hear what Reil wrote about it: "In all mental institutions the inmates should be induced to work, even if this has to be done with slight pressure. Such activity will help improve physical health, assist in the development of a good institutional spirit and will sustain rule and order in the institution. More important: work is an excellent therapeutic means to cure mental ills. Such work should be done as much as possible in the open air. It should be combined with physical activity and should not be monotonous. This last is especially important if one deals with paranoid patients. All such activity should be adjusted to the strength, ability and also to the preference of the inmate. It should be sufficiently attractive to get him away from his fixed ideas. Therefore, in or near any mental institution should be shops of various kind which could occupy the patients according to their abilities and interests. It is doubtlessly possible to develop a system of activities by which all types of mentally ill could be given an activity according to their therapeutic needs. However, we must not let us be pressured by the narrowminded budgetist who, with a tear in his eye, points to any skein of wool which the insane might spoil or who may even hope for an income from such work. Mental institutions, like theatres, are not fit to earn money. For both the community must be willing to sacrifice. Finally we must point out that this therapeutic occupation should be changed according to the course and progress of the cure. In the beginning one might consider primarily to occupy the body. This might later advance to forms which occupy more the psyche by proceeding from mere handicraft to the arts, and finally one could add mental activities."

Reil continues with his view regarding another occupational direction: "Gymnastics and calisthenics which have been specially adjusted for the use by the insane, should do them a lot of good. We also suggest instructing the inmates in drawing and painting, in singing and in music and any other artistic activity which could be made available to them. Concerts seem to me an excellent means of training them in maintaining attention."

Those who still believe that Freud's basic concepts are absolutely new and that in certain ways his ideas in nuclear form had not been envisioned by earlier workers, could learn otherwise from Reil: "If we concede that passions can be the cause of mental disorder, which indeed unfortunately is rather frequently the case, it is the task of the psychiatrist to discover and unveil them, especially if they are the kind which the patient would want to conceal.

Without the knowledge of the cause, there can be no cure. Even demented patients are able to conceal certain of their conditions by hiding them behind fabrications and lies. It must be the professional ability of the psychiatrist to have enough understanding of human nature, cleverness and psychological abilities, besides knowledge of the various expressions of the different mental diseases and a keen capacity for observation of all the patient's utterances. . . ."

How can one protect people against the disadvantageous influences of passions, especially in view of the danger that these may lead to mental disorders? First of all, one should not suppress them but let them be acted out fully. "They are like a rapacious torrent which gets more forceful the more one tries to confine it. Vengeance when it is satisfied and love when it has found response, are less dangerous. Sadness finds release in tears; wrath when it gets a chance to cool. The impact of passions is the more intense, the less they come to the fore. It is most important that one should give aid as soon as possible. Insanity caused by mishaps or death can usually be prevented if one is able to interfere early, before a fixed idea has taken root. Here distraction is one of the best medicines. Loneliness feeds depression; occupation eliminates it. One should satisfy passions but eliminate their cause and offer the patient substitutes which can attract their interest. Finally, one should apply the light of reason, to make the patient understand his error, to see things as they are in nature and give him real value. The understanding of real value is the element which provides the final satisfaction which cannot be separated from the existence of man."

Finally I would like to quote a passage turning the view into quite a different direction of modern psychiatric achievement, actually not relating to psychotherapy but to a diagnostic insight of highest importance to present-day psychiatry and which refers to the aspect of differential topology. In this field, Kretschmer's physio-psychological types still hold the ground solidly. Here is what Reil envisioned in the direction of Kretschmer's types: "There are general differences in the human organization which one must bear in mind. There are people, most of whom have blond hair, large blue eyes, soft skin, who are so delicately organized that they get bruises if one grabs their arm. Others who have mostly a rather hard skin, firm flesh and dark hair are of a contradictory type. Between them are the analogous differences that exist between the flesh of a peach and an apple. The second type has a stubborn nature, the first is smooth, sensitive to the sufferings of mankind and shows a tendency to dream phantasy. Both types have their own tendency to different kinds of mental disorders.

"In classifying such mental disorders it is more important to look for basic motivations than for a set of symptoms. However, one basic difference appears in such a tendency to mental disorder, depending on whether the patient is of sthenic or asthenic nature. This sthenic and asthenic character has a direct relationship to mental disorders. If there are physical characteristics, they can develop into physical illnesses which require physical treatment. In their relationship to mental abnormality, they can have an inverse character. Often a psyche can be rather hyperactive in an individual with a rather weak physique, or psychic activity is stifled when the brain is flooded by blood in a supernormal energetic activity."

All these modern psychotherapeutic thoughts were published in 1803. Much similar data is available from Reil and other authors of the same period. In making an inventory of all this early knowledge, one question forces itself on one's mind. How much is actually new in modern psychotherapy in this century?

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THE HYPOCHOLESTEROLEMIC EFFECT OF NICOTINIC ACID AND ITS RELATIONSHIP TO THE AUTONOMIC NERVOUS SYSTEM*

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INTRODUCTION

NICOTINIC acid, well known physiologically and chemically as a vitamin if administered in small quantities, has many interesting additional properties when given in relatively large amounts. Altschul (2, 3) found that it markedly decreased the levels of cholesterol in rabbits made hypercholesterolemic by diet, and Altschul, Hoffer and Stephen (4) found that in divided dosages of three grams per day this vitamin produced appreciable decreases in the cholesterol levels of healthy young subjects and in patients from a general hospital. The decrease was related linearly to the initial cholesterol levels while the percentage decrease increased as the initial cholesterol levels were elevated. The incorporation of nicotinic acid into atherogenic diets inhibited the development of arteriosclerosis in rabbits (Altschul (2)). Of seventeen animals tested, two showed intense arteriosclerosis, six showed mild change, and nine showed no arteriosclerosis. Without nicotinic acid, at least thirteen of the rabbits would have had severe arteriosclerosis on the basis of many previous studies by Altschul (2) and by many other investigators.

Altschul and Hoffer (5) found similar decreases in the serum cholesterol levels of young volunteers. After two weeks of treatment with nicotinic acid, there was a 22 per cent. decrease in the mean values. During the same period, the B.M.R. increased significantly but to a minor degree. The decrease in cholesterol levels depended upon the initial cholesterol levels and upon body weight. The regression equation calculated from their data gives the equation:

$$Y=0\cdot95x-0\cdot39z-90$$

where Y is the decrease in cholesterol, mg.
x is the initial cholesterol value, mg. and
z is the initial body weight, lbs.

The multiple correlation coefficient is $0\cdot83$.

Recently Parsons, Achor, Berge, McKenzie and Barker (16) confirmed the hypocholesterolemic effect of nicotinic acid. O'Reilly, Demay and Kotlowski (15) found similar decreases. A group of twenty-seven patients without arteriosclerosis and ten patients with clinical evidence of arteriosclerosis showed a decrease in mean cholesterol levels from 217 mg. per 100 ml. to 183 mg. in one

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week and to 173 mg. after six weeks of treatment (a decrease of 44 mg. or 20 per cent.). During the same interval, there was no change in the mean cholesterol levels in ten control patients not treated with nicotinic acid.

For some years, nicotinic acid has been used as part of a therapeutic programme for the treatment of schizophrenia (Hoffer, Osmond, Callbeck and Kahan (13)). Certain aspects of schizophrenic metabolism are different from normal controls. For this reason, cholesterol levels were determined before and after treatment in order to study the relative response of cholesterol levels to nicotinic acid of schizophrenic patients and to compare this to the response of non-schizophrenic patients as reported by others. Schizophrenic patients show different autonomic responses from other patients (Hoffer (12)). The relationship to the autonomic nervous system was therefore examined.

METHOD

All the patients tested were schizophrenic patients diagnosed and treated in psychiatric wards of two general hospitals. Diagnosis was based upon the clinical examination of the patient according to criteria originally described by Bleuler (6) and by Lewis and Piotrowski (14). The patients were admitted to the hospital directly from the community and as a rule were well nourished. In hospital, they received standard hospital diets.

Before receiving treatment, the patients were tested by the mecholyl test developed by Funkenstein (9) and by the atropine test of Hoffer (12). All mecholyl tests were conducted at 1.30 p.m. using a standardized procedure. Reliability of the test was shown by Weckowicz (20). The patients were classified into three groups, i.e. "hypo" where the systolic pressure did not return to the original level within twenty-five minutes after the injection of 10 mg. of mecholyl, "normal" where the original level was regained, and "hyper" where the original level was exceeded. The response to epinephrine was not determined. The results of the atropine tests were rated according to Hoffer (11) into two groups—(1) those scoring between 0 and 4 and (2) those scoring between 5 and 11.

The patients were randomized into two groups (1) those given three grams of nicotinic acid per day in three doses, and (2) those given placebo. A fasting serum cholesterol determination was made using a Lieberman-Burchard reaction, just before treatment, two weeks after treatment had started, and five days or more after treatment was discontinued. The B.M.R. was determined in twenty-two of these patients before and after two weeks treatment.

All the patients were actively treated for their psychiatric disorder and therefore received either electroconvulsive therapy, sedation (including tranquillizers) or psychotherapy in various combinations. The same psychiatric treatments were given to each group. Nicotinic acid treatment was randomized with placebo. Both groups are comparable for cholesterol determination as the only variable was nicotinic acid treatment.

RESULTS

The mean ages and standard deviations for the various sub-samples of the patients are shown in Table I.

None of the means are significantly different from each other. All the standard deviations are not different from each other with the exception of the S.D. for the "normal" mecholyl group which was the smallest of all the groups.

TABLE I

Description by Age of the Patient Groups

Group	Number	Mean Age	Age Range	S.D. of Mean Age
Placebo	24	29·8	16–51	9
Nicotinic acid	33	31·2	16–53	9
Unimproved	9	29·1	17–53	11·6
Improved	19	31·1	16–50	8·4
Atropine score 0–4	9	33·2	18–53	12·1
Atropine score 5–11	20	29·6	16–43	7·5
Mecholyl-hypo	9	36·8	22–53	10·2
Mecholyl-normal	7	27·6	24–38	4·6
Mecholyl-hyper	13	28·2	16–43	8·5

Relationship of Initial Values and Responses to Nicotinic Acid

The cholesterol levels before treatment, after one day of treatment, after two weeks of treatment and a few days after the treatment had been discontinued are shown in Tables II and III and in Figure 1.

TABLE II

Effect of Nicotinic Acid on Cholesterol Levels

				Serum Cholesterol				
Patient	Sex	Age	Weight (lbs.)	Before Treatment	24 Hours Nicotinic Acid	2 Weeks Nicotinic Acid	Percentage Change	After Treatment
1	F	43	160	225	185	200	−11	170
2	M	39	176	235	200	190	−19	—
3	M	19	135	232	187	180	−14	260
4	F	38	135	260	255	255	2	260
5	F	53	142	440	407	400	−9	363
6	F	34	98	255	312	180	−29	295
7	M	29	130	205	—	185	−10	355
8	M	28	160	300	215	260	−13	225
9	M	40	190	125	—	155	+24	180
10	F	34	130	190	—	190	0	260
11	M	18	152	190	—	150	−21	150
12	F	17	111	250	—	130	−48	135
13	M	34	170	235	—	250	+6	225
14	M	22	155	195	—	200	+2	165
15	F	24	120	240	—	105	−56	105
16	M	16	156	150	—	110	−27	150
17	F	30	205	225	—	100	−56	200
18	F	28	146	235	—	—	—	225
19	M	31	172	210	—	235	+12	210
20	F	38	135	230	245	—	—	—
21	F	27	137	200	170	—	—	—
22	F	24	129	160	168	125	−22	175
23	M	30	163	260	220	152	−3	140
24	F	27	116	195	180	130	−33	230
25	M	22	173	195	190	175	−10	255
26	M	25	146	150	—	130	−13	155
27	F	25	160	160	155	130	−19	135
28	F	40	165	200	175	140	−30	170
29	M	37	145	175	—	190	+8	—
30	F	24	116	212	203	105	−50	—
31	F	50	115	205	235	175	−15	—
32	M	38	162	170	152	195	+15	—
33	M	45	224	175	175	—	—	—
Means				215	212	176	−18	206

TABLE III

Effect of Nicotinic Acid (24 hours) and Placebo (2 weeks) on Cholesterol Levels

Patient	Sex	Age	Weight	Serum Cholesterol, mg.% Before Treatment	24 Hours Nicotinic Acid	2 Weeks Placebo	Percentage Change	5 Days After Treatment
34	F	51	160	310	295	325	5	335
35	F	20	100	215	230	230	7	310
36	F	16	125	222	250	260	18	285
37	M	25	125	215	240	245	14	225
38	F	35	125	220	235	242	10	205
39	M	28	166	205	187	200	−2	233
40	F	22	105	200	224	260	15	265
41	F	21	103	225	—	245	9	330
42	F	26	114	175	—	200	14	230
43	M	34	162	210	185	—	—	245
44	F	35	135	245	220	195	−20	245
45	F	33	150	175	165	155	−11	220
46	M	46	153	215	—	—	—	220
47	F	22	119	160	—	245	53	235
48	F	33	143	220	—	220	0	185
49	F	23	95	165	160	170	3	210
50	M	47	177	165	145	160	−2	180
51	M	23	150	180	167	195	8	200
52	F	33	120	213	200	275	29	235
53	F	19	122	150	125	180	20	205
54	M	26	147	125	125	190	52	160
55	F	29	135	180	195	170	−6	197
56	F	23	139	130	165	200	54	215
57	F	46	162	245	180	235	−4	—
Mean				199	194	219	+10	233

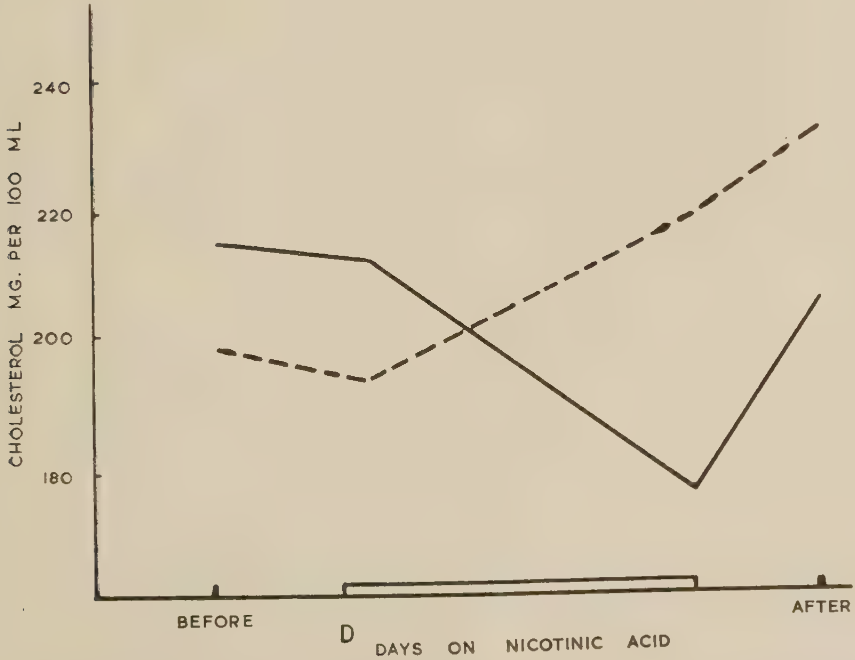

FIG. 1.—Effect of nicotinic acid on cholesterol levels (solid line) and of placebo on patients (broken line).

The mean of the 57 initial values was 208 mg. per 100 ml. (S.D.$=$6·5 mg.). After treatment of 38 patients with nicotinic acid for one day, the serum cholesterol decreased from 212·6 to 203·2 mg. This decrease, although slight, is statistically significant ($t=4{\cdot}7$, p lower than 1 per cent.). This compares with a decrease of 6·4 per cent. reported for 43 subjects having an initial value of 203 mg. (Altschul, Hoffer and Stephen (4)).

After two weeks treatment with nicotinic acid, the cholesterol level had decreased to 176 mg. Five days after treatment, the cholesterol level had returned almost to the original value. In the group on placebo, the initial value was lower than for the nicotinic acid group but there was an increase after two weeks and a further increase after sham treatment. The final value, 233 mg., was significantly higher than was the initial value. The increase may have been due to several factors including hospital diet, psychiatric therapy, etc. The decrease produced by nicotinic acid compares well with that reported by Altschul and Hoffer (5).

The decrease in cholesterol levels was significantly correlated with the initial cholesterol value before treatment ($r=0{\cdot}59$, $t=5{\cdot}8$). The decrease in cholesterol for the schizophrenic patients of this study did not differ from the cholesterol response reported by O'Reilly *et al.* (15). The data from the O'Reilly study was therefore incorporated with this data in order to offer a larger sample and thus obtain a more reliable regression equation relating expected decrease to the initial cholesterol value. The expected decrease is given:

$$Y=0{\cdot}52x-71$$

where x is the initial cholesterol level
Y is decrease in cholesterol, mg.

According to this equation, negative decreases (an increase) will be predicted when the initial cholesterol value is below 136 mg. per cent. When the initial value is much below the normal range, nicotinic acid produces an increase in the level. Out of this series of 64 patients 13 showed an increase. The mean cholesterol value for this sample of 13 was 178 mg. with a mean increase of 34 mg. or 13 per cent.

The decrease in cholesterol levels after one day of treatment with nicotinic acid shows a similar relationship to the initial value. The correlation between decrease and initial value was 0·76, for the study reported by Altschul, Hoffer and Stephen (4) and 0·59 ($t=5{\cdot}8$) for this study. The regression equation for the one-day treatment effect is:

$$Y=0{\cdot}68x-122$$

Both regression lines are shown in Figure 2.

In this study, the dosage of nicotinic acid was uniform for each patient irrespective of initial body weight and sex. Of course, body weight might play a role since heavier patients might have a lesser effective nicotinic acid concentration in the blood. The relationship of body weight to decrease of cholesterol is shown in Table IV.

For the two-week treatment period, the greatest response was achieved with the lighter patients. This did not depend upon a relationship between body weight and initial levels since they were constant for mean weights varying from 105 lbs. to 175 lbs. The majority of patients under 140 lbs. were female. However, the increased response of the patients in the low weight range does not appear to be due to sex. Of 29 patients receiving nicotinic acid for two weeks, 16 were male. Of these, 6 responded with an increase in cholesterol.

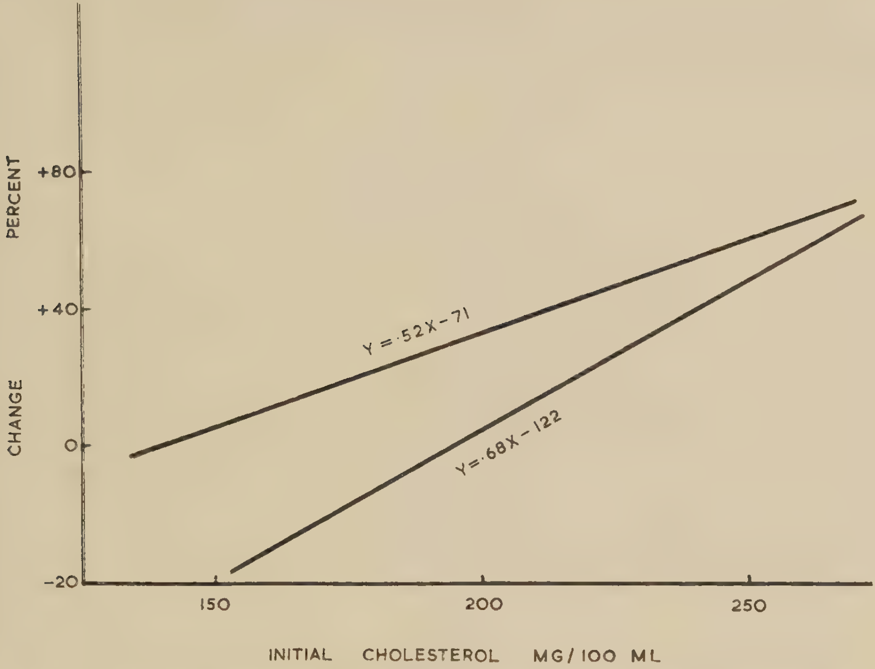

FIG. 2.—Regression equations showing relationship between initial cholesterol level and expected response to nicotinic acid medication.
(1) 2 weeks $Y = \cdot 52x - 71$
(2) 1 day $Y = \cdot 68x - 122$

TABLE IV

Relationship of Body Weight and Hypocholesterolemic Effect of Nicotinic Acid

	Nicotinic Acid (one day)				Nicotinic Acid (fourteen days)			
Weight Range	N	Mean Weight	Initial Cholesterol (mg.)	Change Per cent.	N	Mean Weight	Initial Cholesterol (mg.)	Change Per cent.
90 to 119	8	105	201	5	6	108	213	−33
120 to 139	13	131	204	1	6	130	214	−19
140 to 159	5	150	229	−8	7	151	218	−10
160 to 209	12	171	223	−12	10	174	216	−11

Out of 13 female patients, only 1 did not increase in cholesterol. These ratios are not significantly different (chi square=2·0). The mean response of all the male patient group reported by O'Reilly *et al.* (15) was of the same order as the total group discussed in this study. A comparison of the various studies is shown in Table V.

TABLE V

Comparison of Hypocholesterolemic Effect of Nicotinic Acid of Various Authors

Study Reference	Number	Mean Initial Value	Dosage grams	Effect, Days				Regression Equation
				1	7	14	42	
15	37	217	3	—	—	—	173	
4	43	203	1–3	190	—	—	—	
4	25	284	1–3	222	—	—	—	
5	12	205	3	207	172	161	—	$Y = \cdot 95x - \cdot 39z - 90$
Present	33	215	3	212	—	176	—	$Y = \cdot 28x - \cdot 43z + 53$

The correlation for body weight and cholesterol decrease calculated from the data of Altschul and Hoffer (5) was 0·82. This is not significantly different from the correlation for the present study.

The regression equation relating expected decrease to both body weight and initial cholesterol level is:

$$Y = 0{\cdot}28x - 0{\cdot}43z + 53$$

where Y is the expected decrease
x is the initial cholesterol value, and
z is the body weight.

The multiple correlation coefficient is 0·43 ($t = 2{\cdot}65$). The data of Altschul and Hoffer (5) yields a different equation:

$$Y = 0{\cdot}95x - 0{\cdot}39z - 90$$

with a multiple correlation coefficient of 0·83. This is significantly higher than for this series of schizophrenic patients.

Relationship of Autonomic Tests and Cholesterol Response to Nicotinic Acid

The relationship of the mecholyl and atropine tests and the response of cholesterol to nicotinic acid is shown in Table VI. The starred values differ significantly at the 1 per cent. level from the total values.

TABLE VI

Relationship of Autonomic Tests to Cholesterol Response to Nicotinic Acid

Group	Number	Initial Cholesterol Mean	Ratio	Expected Ratio
Total	57	208	—·16	
Mecholyl-hyper	13	216	—·17	—·19
Mecholyl-normal	7	182*	—·25*	—·13
Mecholyl-hypo	9	242*	—·13*	—·23
Atropine 0–4	9	233*	—·25*	—·22
Atropine 5–11	20	207	—·14	—·18

* Statistically significant.

The hypo mecholyl respondents had higher initial cholesterol values and decreased least when given nicotinic acid. The normal mecholyl respondents had the lowest original cholesterol values and showed the greatest decrease to nicotinic acid. Patients in the 0 to 4 atropine group, i.e. normal sympathetic activity, had higher initial values with an increased response to nicotinic acid. Patients in the 5 to 11 atropine group (the expected response for schizophrenics) had normal initial cholesterol values but responded less than the total group to nicotinic acid.

Relationship of Clinical Response to Therapy and Cholesterol Response to Nicotinic Acid

Patients receiving nicotinic acid were divided into two groups (1) where the psychiatric response to treatment was good and (2) where there was a poor clinical response. These evaluations were based upon discharge evaluation and upon follow-up investigation in the community after discharge. The group of 9 patients who did not respond well clinically had a higher initial cholesterol level which decreased less than would be expected. The patients who responded well to therapy had normal initial cholesterol levels with a slightly stronger hypocholesterolemic response to nicotinic acid.

TABLE VII

Relationship of Clinical Response and Cholesterol Decrease

Group	Number	Initial	Ratio	Expected Ratio
Total	57	208	—·16	
Improved	19	205	—·20*	—·17
Unimproved	9	243*	—·14*	—·23

* Statistically significant.

Relationship of B.M.R. to Hypocholesterolemic Responses to Nicotinic Acid

B.M.R.s were determined before and two weeks after treatment. Nicotinic acid significantly elevated the B.M.R. in both normals and schizophrenics. This was more pronounced in the schizophrenic group.

TABLE VIII

Relationship Between Diagnosis, B.M.R. and Cholesterol Response to Nicotinic Acid

Diagnosis	Treatment	Number	Initial B.M.R.	B.M.R. After Two Weeks	Change in B.M.R.
Schizophrenia ..	Nicotinic acid ..	12	−1·58	13·3	14·88*
Schizophrenia ..	Placebo	10	−5·80	−5·50	0·30
Normals (1) ..	Nicotinic acid ..	12	−9·75	−3·30	6·45*

(1) Altschul and Hoffer (1957).
* Statistically significant.

DISCUSSION

Nicotinic acid is hypocholesterolemic for patients who have elevated cholesterol levels and tends to be hypercholesterolemic for patients who have abnormally low cholesterol values. Values which deviate toward either extreme are brought toward the normal range.

Paolantonio (17) reported that ultraviolet irradiation following the method described by Altschul (1) decreased cholesterol levels within four weeks. Examination of this response indicates that the magnitude of response of the Italian patients to ultraviolet is of the same order as was the response to nicotinic acid in our series. A similar study by Altschul (1) with a larger series of patients shows that the cholesterol decrease for the Canadian series given ultraviolet was less pronounced than the response of the Italian series and less pronounced than the nicotinic acid response. The total range of cholesterol values in the Italian series was much lower than the Canadian series of Altschul (1). Both sets of ultraviolet data are shown in Table IX.

The regression equation relating decrease to only initial cholesterol value works reasonably well for the range of cholesterol values below 229 mg. but predicts decreases much greater than was found with ultraviolet. Apparently nicotinic acid is a more effective hypocholesterolemic substance for Canadian patients as reported in the study of Altschul (1) and this study. In the Italian series where in general cholesterol values are lower, ultraviolet was as effective as nicotinic acid in the Canadian series.

TABLE IX

The Response of Cholesterol to Ultraviolet Irradiation

A.—Study of Paolantonio (17)

Range	Number	Initial	Final	Predicted from Regression Equation
110–129	3	131	135	134
130–149	7	143	146	140
150–169	10	160	149	148
170–189	7	182	149	158
190–209	10	199	173	166
210–229	8	219	175	176
230–279	4	260	223	196

B.—Study by Altschul (1)

Range	Number	Initial	Final	Predicted from Regression Equation
110–129	1	111	135	124
130–149	2	141	129	139
150–169	7	160	181	148
170–189	5	178	158	156
190–209	13	200	181	167
210–229	13	222	194	178
230–249	8	242	206	187
250–269	12	259	231	195
270–289	8	278	246	205
290–329	5	304	288	217
330–470	4	368	334	248

The agreement between the response to ultraviolet and nicotinic acid is reasonably good. Apparently, both factors have a similar action upon cholesterol metabolism and perhaps they normalize the same metabolic pathway.

The mechanism whereby nicotinic acid decreased elevated cholesterol levels is not known. If the action were only hypocholesterolemic, one might postulate some interference with absorption of lipid or some increase either in overall utilization or an increase in excretion. It is more likely that nicotinic acid plays a more fundamental role by normalizing cholesterol metabolism. Since nicotinamide, the constituent of DPN, has so far not been proven to lower cholesterol levels, the response to nicotinic acid is not dependent upon the respiratory enzyme *per se*.

The relationship of the cholesterol response to the autonomic tests may depend upon the secretion of norepinephrine and epinephrine. Epinephrine, according to Raab (18), is fundamentally related to arteriosclerosis. He states that all arterial walls contain epinephrine derived from sympathetic nervous endings and from the adrenal medulla. Injections of epinephrine produce media necrosis, thickening of the intima (which may be secondary) and increased deposition of cholesterol in the intima. In animals (Raab (18)), excessive treadmill exercise (which promotes catecholamine discharge) greatly accelerates the deposition of cholesterol in the coronary vessels. Epinephrine also alters plasma lipid ratios. Dury (7) reported that injections of epinephrine into rabbits markedly increased the serum content of total lipids, phospholipids and neutral fat. These values reached a maximum after 48 hours and remained high for five days. Cholesterol levels were also at a maximum after 24 hours and remained elevated for five days.

The mecholyl test (Funkenstein (9)) measures central sympathetic reactivity

(Gellhorn (10)). Funkenstein (9) has shown that patients who show a hypo-mecholyl response tend to over-secrete epinephrine rather than norepinephrine. This group is, according to Funkenstein, characterized by an increased peripheral output of epinephrine and by a decreased reactivity of the sympathetic nervous system. The patients in this study who were hypo-reactive were much higher in initial cholesterol values and reacted very sluggishly to the administration of nicotinic acid. Patients with normal and hyper-mecholyl responses, according to Funkenstein (9), tend to over-secrete norepinephrine. These groups had a normal or decreased initial cholesterol level and either over-reacted or reacted normally to nicotinic acid. There is therefore a consistent relationship between the apparent over-secretion of epinephrine or norepinephrine and the initial cholesterol levels and their response to nicotinic acid.

The atropine test is a measure of sympathetic reactivity (Hoffer (12)). Patients with scores between 0 and 4 have normal response to atropine and presumably are able to respond to additional stimulus. With this group, the hypocholesterolemic response to nicotinic acid was greater than one would expect from the mean response of this study. Patients with scores between 5 and 11 are not able to respond to further stimuli. Their cholesterol response to nicotinic acid was below normal.

The schizophrenic patients who did not respond to therapy were higher in initial cholesterol levels and the decrease to nicotinic acid was sluggish. Thus, it appears that schizophrenics from this group with relative over-secretion of epinephrine as indicated by the mecholyl response and by the initial higher cholesterol levels have not as good a prognosis clinically.

There apparently is some relationship between epinephrine metabolism and cholesterol levels. This data provides some confirmation for the observations of Schmidtmann and Huttich (19) and Westphal and Hermann (21) relating epinephrine to cholesterol metabolism. Nicotinic acid which is useful for the treatment of early schizophrenia (Hoffer, Osmond, Callbeck and Kahan, 1957) may decrease the production of epinephrine by producing a relative deficiency of methyl groups. This might be an explanation for its hypocholesterolemic effect. Against this concept is the lack of hypocholesterolemic effect of nicotinamide when administered for twenty-four hours. Perhaps there is some relationship to glycine. Nicotinic acid is excreted primarily as nicotinuric acid whereas nicotinamide is excreted mainly as N-methyl nicotinamide.

Summary

Nicotinic acid tends to normalize cholesterol levels in schizophrenics, normals and non-schizophrenic patients in the same way. The change is partially dependent upon the initial cholesterol values and upon body weight. The change can be predicted by regression equations. There is some relationship between the hypocholesterolemic response and autonomic tests.

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PROGNOSIS IN SENILE DETERIORATION

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It is now generally conceded that slow wave activity tends to appear in the EEG as age advances. Attempts have been made with varying success to relate these slower rhythms to the presence of organic cerebral deterioration.

Two papers from this department—Robinson (1954), McAdam and Robinson (1956)—described a fairly homogeneous series of 50 patients over 65 years suffering from senile or arteriosclerotic dementia. A clinical rating scale was devised with which to estimate the level of deterioration in these patients. It was found possible to relate quantitatively the degree of intellectual deterioration to the amount of low-frequency activity in the EEG. The coefficient of correlation between the clinical rating and EEG rank order was 0·79 (P0·001) which is significant at the 0·1 per cent. level of confidence.

It was suggested as a result of these findings that the EEG might prove a prognostic indicator in such cases. This paper is a preliminary report on follow-up studies carried out on the same series of patients. It is confined to the 24 members of the original pilot study.

Four years have passed since the investigation was begun. All the patients discussed here have been followed up for between 3 and 4 years.

Original Assessment

On the basis of the original clinical and EEG assessment it was found possible to divide the cases into three groups showing mild, moderate, and severe deterioration.

The standard required for inclusion in the mild group was "well orientated in all spheres. They showed only minor defects of both recent and remote memory. All knew their respective ages and how long they had been in hospital and showed a fair knowledge of the outstanding current topics of national and local interest. They were able to deal with simple arithmetical problems and some completed the Serial 7's Subtraction Test—almost all were engaged in productive activity." It was found that the EEGs of these patients showed the features of a normal record except that there was a slightly excessive output of low frequency activity which was inconspicuous and usually required special analyser apparatus for its detection.

Seven patients were included in this category on EEG rating. The "mild" clinical group was identical except for one patient who was relegated to the moderate group.

In the moderate group there was "poor orientation with marked memory defect and confabulation. Arithmetical ability was at the level of 'how many threepennies in 1s.?' The interview situation was fairly well appreciated and attention was well sustained. Most of them made spontaneous mention of their failing abilities." In the EEGs of this group the features of a normal record were obscured by low frequency activity although normally responsive alpha rhythm could still be revealed by the use of filters.

Ten patients fell in this EEG category. The clinical group had in addition the patient mentioned above.

With the severely deteriorated patients "only poor rapport could be established, replies were often vague and nonsensical. Spontaneous talk consisted of disjointed incoherent ramblings. They were incontinent (often doubly so) and had to be dressed and washed and sometimes fed. All were completely disorientated." Their EEGs showed continuous low-frequency activity and a completely disorganized record.

There was clinical and EEG agreement on the 7 patients who constituted this group.

FOLLOW-UP

Patients Graded "Mildly Deteriorated" on Clinical Rating Scale

There were 6 patients in this group. Of these 4 are still alive. One died 39 months after the original assessment and the other after only 6 months. It is noteworthy that the latter patient died from the effects of a fractured femur. Of her mental state it was recorded on the day of the injury: "Still fully orientated and showing no new signs of intellectual impairment." It may be speculated that had it not been for the accident her survival might have been comparable to the rest of the group.

When these 2 deaths are included the average survival rate for the group is at present (May, 1957) 37 months.

Patients Graded "Mildly Deteriorated" on EEG Assessment (7 Patients)

These consisted of the group above with the addition of one patient who was later discharged home and died there suddenly from a suspected cerebral thrombosis 6 months after the original assessment.

The average length of survival to date for this group is therefore 32·7 months.

Moderately Deteriorated EEG Group (10 Patients)

Of these only 2 are still alive. The first death occurred after only 4 months as a result of repeated "strokes". The rest occurred between 10 and 34 months. The present average length of survival of the group is 24 months.

Moderately Deteriorated Clinical Group (11 Patients)

This consists of the same 10 patients with the addition of the patient described in the "mild EEG" group. The average length of survival to date for this group is 22·6 months.

Severely Deteriorated Clinical and EEG Groups

As there was complete clinical and EEG agreement in this case the same 7 patients constitute both groups. All are dead. The average length of survival was 10 months.

	Present Average Length of Survival of Groups (in months)		
	Mild	Moderate	Severe
EEG rated groups	32·7	24	10
Clinically rated groups ..	37	22·6	10

COMMENT

It will be seen that the high degree of correlation between clinical and EEG assessments has so far been justified. Both have been successful predictors of outcome.

In rough figures the survival rates of the three groups have been: "Mild"—3 years, "Moderate"—2 years, "Severe"—1 year.

The clinical rating scale has proved only slightly more sensitive a prognosticator than the EEG.

At a later date it is intended to present results for the complete series together with a comparable series of depressives in the same age range.

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INITIAL PSYCHIATRIC ILLNESS IN INVOLUTIONAL WOMEN

III. ELECTROENCEPHALOGRAPHIC FINDINGS

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INTRODUCTION

A MULTI-DIMENSIONAL study of a consecutive series of female patients, aged 40–55, in whom psychiatric illness necessitated first admission to a mental hospital, has already been reported in its general and clinical aspects (Tait, Harper and McClatchey, 9) and in relation to the psychological test findings (Orme, 6).

Of the 54 women included in the original group, 46 had EEG records taken on admission. In 8 cases recordings could not be made at the appropriate time, for technical reasons or because of the clinical urgency of instituting treatment —such as E.C.T.—which alters EEG patterns. The technique of EEG examination has been described previously (McAdam and McClatchey, 1). In the present investigation, band-pass filters (Morris and Dawe, 4) and per cent. time-recording units (Morris, 3) were employed to aid accurate measurements of the EEG variables under consideration.

HYPOTHESES AND METHOD

The electroencephalographic side of this study was intended to explore further some hypotheses about the relation between certain persistent personality traits, on the one hand, and patterns of the normal range of EEG variation, on the other, which have already been reported in respect of a group of male alcoholics (McAdam and Orme, 2). In brief, findings then indicated that a dichotomy of personality traits might be related to the EEG tracing as a whole. Qualities which might suggest "extraversion" were apparently related to a predominance of high frequency (i.e. beta) activity in the EEG, and those suggesting "introversion" to a predominance of alpha activity. Further, from the EEG patterns there were statistical indications of a general EEG dichotomy, namely that a predominance of high frequency activity was associated with a low alpha index, little sign of low frequency activity, and a tendency for the alpha index to change; whereas a high alpha index was associated with a low index of high frequency activity, a relatively larger amount of low frequency activity, and was constant. Lastly, an inverse correlation was found between alpha index and alpha frequency; that is, the lower the dominant alpha frequency, the higher was likely to be the alpha index. These findings were discussed, and compared with those of Saul *et al.* (7, 8) and Mundy-Castle (5).

It was felt that a further study, on broadly similar lines, should be carried out on another group of patients, to see if similar correlations might emerge. The group of women chosen for the present study, although confined in age range and in being first admissions, reflected a heterogeneous selection of diagnoses, thus adding an additional dimension of comparison. In addition, a number of more impressionistic hypotheses about personality and EEG pattern had now been formulated which often seemed borne out on a case basis. These are mentioned immediately below, and it seemed opportune to attempt a preliminary trial of their validity when applied to a group of patients for whom adequate clinical data were available.

The assessment of the EEG data was therefore made by the senior author quite independently of any information on clinical state or psychological test results, and only when all findings were complete was the material evaluated and compared. The EEG variables measured were five in number:—

1. *Alpha Index.* This represents as a percentage the duration of time in which alpha activity is present. As a broad statement, it was felt that a high alpha index represented a "low fantasy control", and conversely. By "low fantasy control" is implied a pre-occupation (without tension) with internal events, a persistent and consistent homeostatic adaptation largely irresponsive to environmental interruptions: it might be found associated with a passive withdrawn personality type (cf. Saul, 7) or pathologically with a sustained mood change in hypomania or apathetic resigned depression, or in a classical conversion hysteria. "High fantasy control" (a low alpha index) would correspondingly imply greater environmental pre-occupation, and less with the inner life. The records were therefore sorted into four groups: of high fantasy control (11), fairly high (6), moderate (13) and little (16).

2. *Alpha Frequency Spread* represented the range of frequencies in the alpha band occurring in any single record. A wide range might be related to irregularity of thought sequences, and vice versa. Where the alpha frequency was regular, therefore, the thought sequences might also be assumed to be stable, logical and predictable; conversely, where it was irregular, the thinking might be catathymically determined and the responses to stimuli apparently random. In these terms, the records were sorted into regular (19), fairly regular (16) and irregular (11).

3. *Dominant Alpha Frequency* itself, where this existed, was held to determine primary or secondary functioning (cf. Mundy-Castle, 5). A relatively fast stable alpha rhythm would equate to primary function, and a slow stable alpha rhythm to secondary. Very broadly, primary function would imply quickness and variability of response, and secondary a tendency to rumination, to constancy and perhaps obsessional thinking with a long reaction time. Of the records only 20 could easily be classified in this manner, these being composed of 11 primary and 9 secondary. Intermediate records numbered 6, and the remainder were insufficiently regular to be classified; these latter two groupings have been excluded from the calculations.

4. *Amount of Beta Activity* in the record was assessed, and classified in terms of none (7), little (20), moderate (8), fairly high (6), and high (5). Hypothetically, a high amount of beta (high frequency) activity might be linked with "aggressiveness", a driving or perhaps constructive character, or pathologically with trends exploiting the environment, as in a complaining manipulative hypochondriasis.

5. *Amount of Theta and Delta Activity present* was assessed. The hypothesis was that this related directly to "affective impulsiveness" or lability. Where it

was low, there might be little variability in expression of affect, although pathologically it might be very low where the affective expression was sustained and consistent, as for example in mania, depression or conversion hysteria. Where the amount of slow activity was high a tendency to emotional explosions might be present. Slow activity was assessed as none (10), little (21), moderate (8), and relatively high or high (7).

The problem was therefore to see whether any of these variables had any relation to the independently assessed clinical and psychological data, whether related to diagnostic category or independent of it.

RESULTS

A. *Internal Correlations of the Five EEG Indices*

The five EEG indices, outlined above, were first examined to see if any internal correlations, each with the other, appeared, either on the lines which had been evident in the study of alcoholics, or in any other way; if such combined EEG patterns appeared, a consideration of the clinical data in their light might prove of interest.

There was some slight evidence of trends of association in certain combinations. Thus, higher alpha indices (in terms of our hypothesis, low or moderate fantasy control) were associated with irregularity in the alpha range (unstable, illogical, and unpredictable thinking): only 9 of 29 patients with higher alpha indices had regular alpha frequencies, as opposed to 10 of 17 patients with lower alpha indices (χ^2 (Yates)$=2{\cdot}364$: $P<{\cdot}2$). Where the alpha index was high, moderate to high amounts of slow activity appeared in 12 of 29 cases, as opposed to only 3 of 17 cases where alpha index was low ($\chi^2=1{\cdot}773$:$P<{\cdot}2$): this is in accord with the findings in alcoholics. In none of the other eight instances of comparison—including the relation between beta and alpha amounts—was there any indication of association between the EEG variables.

The two trends which are mentioned are of no statistical significance. We must therefore assume that in the present investigation there was no support for the previously recorded view of an overall EEG dichotomy, and there was no firm indication, for the numbers involved, of any other association between EEG variables.

B. *Psychological Data and EEG Variables*

The patients concerned in this study each had a Standard Psychological Interview, the Rorschach Test, and the Thematic Apperception Test. From the total data obtained a psychological dichotomy was made between the most and least typical sections of the sample (Groups A and B respectively). This dichotomy, on examination, bore some relationship to "extraversion-introversion" dichotomies. On the other hand, the psychiatric distinction between non-psychotically depressed and psychotically depressed patients (Groups C and D respectively) also seemed to have affinities with "extraversion-introversion" dichotomies. However, Groups A:B and C:D were themselves unrelated—a feature suggesting that "extraversion-introversion" was not a unity but applied to at least two unrelated modes of variation. This work has already been reported in detail (Orme, 6).

The relation between "extraversion-introversion" and EEG patterns, apparent in a group of male alcoholics, has been outlined above. In the light of this previously published work, chi-square examinations were now made between the two personality dichotomies of the present study of involutional women, and the five EEG variables assessed for this group.

The results obtained are essentially negative. No significant relationship was evident between any of the EEG measures and the psychological A:B dichotomy. The absence of significant associations persisted when (*a*) stable EEGs alone were considered; (*b*) the A:B dichotomy was linked with the C:D dichotomy, on the hypothesis that the group A+C should be extraverted in both ways, and B+D introverted; and (*c*) the psychotic-depressive Group D was excluded (as the alcoholic group specifically excluded psychotics).

The only trend of association noted was between high and low alpha index and B:A. The level of probability here was between 0·1 and 0·2. This trend is in keeping with previous work, but is here only of a low level of statistical significance.

C. *Clinical Data and EEG Variables*

Many clinical data, referring to the biological and sociological background of the patients, their current symptoms and behaviour, and their diagnosis were available (Tait *et al.*, 9). All this material was evaluated and compared with the EEG indices, but here only those items which seemed particularly relevant to the hypotheses, or those which in fact showed, however unexpectedly, any trend of association, are mentioned.

1. *Age.* Three age groups were considered: 40–44, 45–49, and 50–54. Age did not seem related to alpha index, to primary or secondary function, to beta amount, or to slow activity. There were, however, indications that the greater the age the less the regularity of the alpha activity. In the full table ($r=4$) $\chi^2=10\cdot76$, $P<\cdot05$, but this is affected by the smallness of the numbers involved. Condensing into regular, as opposed to fairly regular and irregular taken together, and making a fourfold table with patients under and above 45, χ^2 (Yates)$=3\cdot3$, $P<\cdot1$. There is therefore some indication that thought sequences, in our terminology, show increasing irregularity with age.

2. *Insomnia.* Data were available concerning the incidence of insomnia, and whether this was of early or late type, or combined. There was no evidence of association with any of the EEG variables.

3. *Menopause.* It was recorded whether or not the patients were past the menopause. Of the 17 patients regarded as having high or fairly high fantasy control (that is, of lower alpha indices) only 3 had passed the menopause; whereas 14 of 29 in the moderate to high alpha index ranges had done so ($\chi^2=3\cdot101$: $P<\cdot1$). There was thus some indication that patients who had passed the menopause showed less fantasy control. Similarly only 5 of 27 patients with no or little beta activity had passed the menopause, as opposed to 12 of 19 with moderate to high amounts of beta activity ($\chi^2=7\cdot72$: $P<\cdot01$). It would therefore seem that beta activity, indicating according to our hypothesis "aggressiveness", may be of more frequent incidence in post-menopausal patients. There were no indications of correlation of the menopause with the other three EEG variables.

4. *Exhaustion and fatigue*, as repetitive complaints, were next considered. There was some trend for exhaustion and fatigue seeming more prominent with increasing irregularity in the alpha range, that is, in our terminology, of irregularity in thought sequences; contrasting regularity on the one hand with records which were irregular or only fairly regular on the other, $\chi^2=2\cdot887$, and

$P<1$. There was also some indication that complaints of exhaustion and fatigue were more common in patients with high and fairly high amounts of beta activity (9 of 11) than the others (16 of 35) ($\chi^2=3\cdot063$, $P<\cdot1$); this might be regarded as being in accord with the broad terms of the hypothesis.

5. *Tension, and agitation*, occurring as prominent symptoms in the clinical picture, showed no relation with any of the five EEG variables.

6. *Delusions, Hallucinations, and Clearly Paranoid Symptoms* were not of frequent occurrence in the clinical material, but none of these psychotic phenomena, for the numbers available, showed any indication of association with the EEG data. The only possible exception to this statement is that of 9 patients with clearly paranoid symptomatology, 8 had no or little beta activity present.

7. *Hypochondriasis* was considered in each of two forms; firstly where repetitive hypochondriasis was expressed in fairly real somatic terms, and secondly where the hypochondriasis was psychotic and bizarre. There was no sign of association of either with the EEG variables.

8. *Obsessive-Ruminative Symptoms* were present in clear and persistent form in only 7 of the 46 patients. Only 3 of the patients regarded as having primary function were clinically obsessional, and 1 of those with secondary function, which lends no support to our hypothesis that secondary functioning might be associated with rumination and obsessive thinking.

9. *Over-particular Personality:* This personality rating, covering the type of rather rigid, meticulous, particular but not pathologically obsessional character said to be of common occurrence in involutional illness, was given to 17 of the 46 patients. There was no indication of any relationship with the EEG data; 5 patients with this type of personality were regarded as having primary function as opposed to 2 with secondary function, again contrary to our expectations.

10. *Aggression, and Demanding Behaviour*. The occurrence of aggressive symptoms, and of lesser degrees of demanding behaviour, dissatisfaction and critical attitudes was clinically rated. Clinical manifestations of this sort showed no correlation with the EEG variables.

11. *Mood Swings*, occurring in the past, showed no hint of association with EEG patterns.

12. *Self-blame, and Self-criticism*, as sustained clinical features, showed similarly no correlation with EEG data.

13. *Diagnosis*. The patients represented a variety of diagnostic categories, including psychotic depression, a number of neurotic syndromes, alcoholism, and schizophrenia. No relation between diagnostic category and EEG data could be ascertained. It may however be mentioned that 5 of the 6 hysterias lay in the category of moderate or little fantasy control, which would agree with expectation.

Discussion

In general, the results fail to show support for the hypotheses.

Firstly, with regard to the association between "extraversion-introversion" and EEG patterns, and with regard to the overall EEG dichotomy, both formerly reported for the group of alcoholics, the current investigation failed to give any significant confirmation of the previous findings. One reason for this may lie in the fact that the group of involutional women was much more heterogeneous in clinical composition, a majority of the group being psychotic. It was noted (Orme, 6) that there were indications that introversion-extraversion may be a more complex variable than is sometimes appreciated. In severe disturbances particularly, as with the involutional group studied here, its components may be less integrated than in normals and less disturbed subjects. Another possibility is that the alcoholic group as a whole either possessed (or lacked) some personality feature—and by so doing, simplified the position by holding constant certain variables. Whatever alternative applies, the reduction of the correlation between EEG and personality variables in the involutional group may well be attributed to its more complex composition.

Secondly, the set of general and loosely framed hypotheses about the possible clinical meaning, for this group of women, of the 5 EEG variables found little support on analysis. Where there was some suggestion of association, as in the relation to the menopause of high alpha index and of greater beta activity, this was outside the terms of the hypotheses. These negative results can be interpreted in various ways. They may be taken at their face value as indicating that there is in fact no relationship of the type suggested between clinical data and EEG variables, or more correctly that this relationship if it exists is not sufficiently strong to be manifest in this number of patients. Alternatively we may wonder whether the design of the investigation was sufficient to test the hypotheses adequately. The EEG data and the assessments of clinical state were kept rigidly apart, the clinical variables being derived from the observations of two clinicians and determined by a third. This was a matter of deliberate policy, in the desire to avoid any possible contamination or bias in the clinical assessments. However the coincidence of loosely formulated hypotheses and relatively crude independent clinical data may make for an incomplete testing ground, and more refined techniques of study will be at least considered.

SUMMARY

1. Following on work showing a dichotomy of personality traits in alcoholics which was related to EEG patterns, a broadly similar investigation of a group of involutional women having their first major psychiatric illness is reported. In addition, certain other hypotheses about the clinical meaning of EEG variables were tested.

2. The results in general did not support with any degree of confidence the earlier findings and did not verify the additional hypotheses. The reasons for this are discussed.

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"RITALIN" AND CHLORPROMAZINE IN CHRONIC SCHIZOPHRENIA: A CONTROLLED CLINICAL TRIAL

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RITALIN (methylphenidate) is a drug which was developed by the firm of Ciba Limited. It resembles amphetamine in its central stimulant and sympathomimetic action but has quite a different chemical structure. Its general properties have been described by Meier *et al.* (1954) and by Drassdo and Schmidt (1954 a, b). Geller (1955) and Stier (1955) used Ritalin in the treatment of depressive states associated with apathy, while Ferguson (1955) found it of value in countering the depressive effects of reserpine therapy. Ferguson also notes that Ritalin seemed to have a beneficial action in cases of chronic schizophrenia and considered that his findings warranted a clinical trial.

The purpose of the present investigation was to determine, by a self-controlled trial, whether Ritalin was of value in the treatment of unselected chronic schizophrenic patients in a mental hospital ward. As there is fairly general agreement that chlorpromazine is of value in chronic schizophrenia, we also carried out a trial of this drug with the object of validating our methods of assessing clinical improvement.

METHOD

In a ward of 60 male chronic schizophrenic patients, 48 were arbitrarily chosen for the trial. The average age of the trial patients was 46, with a range of 28 to 64 years. The average time since their last admission to hospital was 18 years, with a range of 2 to 40 years. Fourteen patients had been subjected to leucotomy. In the opinion of the charge nurses and ward physician, thirteen were mainly overactive and aggressive, twenty-three were mainly apathetic. During the five months of the trial, patients received no other drugs or special methods of therapy with the exception that four who had at one time had epileptic fits continued to receive anti-convulsant drugs.

The drugs tested were: Ritalin 10 mg. t.i.d.; Ritalin 20 mg. t.i.d.; and chlorpromazine 50 mg. t.i.d. These were administered in a syrup which, when given without the addition of any drug, served as the inert control. Quassin was added to the control syrup to mimic the bitter taste of chlorpromazine. The trial lasted for five months (more precisely, for five periods of four weeks each). For the first month, all patients received only the control syrup; this enabled the nurses and physician to become accustomed to the methods used for assessing the patients' symptoms and behaviour. For the succeeding four months, each patient received each drug, including the inert control, for a month at a time. The drug order for the 48 patients conformed to a Latin square design. Physician, nurses and patients were unaware of the order in which the drugs were given.

The effects of the drugs were assessed in two ways. At the end of each trial month the ward physician (B.J.S.) rated the severity of each patient's symptoms on a seven-point scale; a list of 18 symptoms common in chronic schizophrenia was used. It was intended that the assessment of symptoms should be made independently by two physicians but one physician left the hospital before the trial was completed. At the end of each week the nurses assessed the patients' behaviour on the Barrabee-Hyde behaviour rating scale; on this scale (Greenblatt and Solomon, 1953) seven general aspects of behaviour are rated on a five-point scale.

The 48 patients were divided into four groups, each group coming under the special care of two nurses; thus, though there were eight nurses on the ward, each patient was rated by the same two nurses throughout the trial. During the course of the trial there were no admissions to the ward, no patients were discharged or transferred, and none was physically ill.

RESULTS

The results were primarily recorded by comparing, for each patient, the rating score obtained during the month on a drug with that obtained during the control month; the drug score was then classed as "better than", "equal to" or "worse than" that of the control.

We may consider first the results of the physician's rating of symptoms. With Ritalin, the number of patients scoring "better" on the drug than on the control was not, for any of the 18 symptoms, significantly greater than the number of patients scoring "worse"; this was true for both doses of Ritalin. With chlorpromazine, on the other hand, the number of patients scoring "better" as compared with the control was significantly (at the 5 per cent level) greater than the number scoring "worse" in eight of the 18 symptoms. These eight symptoms and the scores are shown in Table I. The ten symptoms not showing significant improvement on chlorpromazine were: lack of energy and initiative; hallucinations; delusions; incoherence of speech; emotional outbursts; impulsive behaviour; stereotypy of speech and/or behaviour; depression; anxiety, tension or agitation; and confusion.

TABLE I

Number of Patients whose Symptoms were rated "Better", "Equal" or "Worse" during the Chlorpromazine Month as compared with the Control Month

Symptom	Better	Equal	Worse
Replies to questions vague, brief or careless	20	23	5
Incongruity of affect	21	20	7
Withdrawal from other people	19	22	7
Extent to which hallucinations and delusions influence behaviour	22	18	8
Paranoid attitude	24	14	10
Incontinence of urine and faeces	11	36	1
Flattening of affect	25	11	12
Aggressive behaviour	11	34	3

These results may also be expressed in terms of the number of symptoms which, on the whole (i.e. in which more patients scored "better" than scored "worse"), were rated better when the patient was receiving the drug. This is shown in Table II.

TABLE II

Number of Symptoms rated on the whole as "Better", "Equal" or "Worse" during the Drug Month as compared with the Control Month

Drug	Better	Equal	Worse
Chlorpromazine	17	1	0
Ritalin 10 mg. t.i.d.	11	0	7
Ritalin 20 mg. t.i.d.	8	2	8

The nurses' score for a patient during each drug-month was obtained by taking the mean of the two raters' scores for each week, and the mean of these four weekly scores. There was no instance for either Ritalin or chlorpromazine, in any of the aspects of behaviour, where the number of patients scoring "better" than on the control was significantly in excess of the number scoring "worse". There was, however, a clear general tendency for patients to score better on chlorpromazine than on the control, a tendency which was not present for Ritalin. This is shown in Table III, where it may be observed that, on chlorpromazine, more patients scored "better" than scored "worse" for each of the seven aspects of behaviour studied; the excess of patients scoring "better" for initiative approaches the 5 per cent. level of significance.

TABLE III

Number of Patients scoring "Better" or "Worse" for different aspects of Behaviour when scores on the Drug Month are compared with those on the Control Month

Aspect of Behaviour	Drug					
	Ritalin 10 mg. t.i.d.		Ritalin 20 mg. t.i.d.		Chlorpromazine	
	Better	Worse	Better	Worse	Better	Worse
Self-care	20	28	20	24	26	20
Co-operation	21	26	20	27	25	22
Productivity	21	21	18	25	22	19
Conversation	21	22	21	20	25	16
Group participation ..	25	23	26	21	29	18
Sociability	22	17	19	17	21	13
Initiative	22	23	21	25	28	16
	152	160	145	159	176	124

A more detailed examination of the rating scores did not reveal any tendency for the over-active, aggressive patients to respond differently from the apathetic ones, either on Ritalin or on chlorpromazine. Thus of the 15 patients who showed most improvement on chlorpromazine, four were over-active and eight apathetic; and of the 12 who improved most on Ritalin, two were overactive and six apathetic.

Side Reactions

Sixteen patients were at some stage of the trial described by the nurses as markedly confused or drowsy; in 13 instances this occurred while the patient was on chlorpromazine and in one case each while the patient was on Ritalin 10 mg. t.i.d., on Ritalin 20 mg. t.i.d. and on the control syrup. It may be observed that, of the thirteen patients who became markedly drowsy on chlorpromazine, only three showed any general improvement compared with the control month; this would seem to discount any marked bias towards favourable rating of patients thought to be on chlorpromazine. Fourteen patients were at some stage described as unduly restless or agitated; in ten instances this occurred while the patient was on Ritalin, in three while he was on chlorpromazine and in one while he was on the control. In five instances, the dose of the drug was halved for a few days because of the patient's untoward behaviour; in three of these instances, the patient was on chlorpromazine at the time, in one he was on Ritalin (20 mg. t.i.d.) and in one on the control. No other noteworthy complications occurred during the trial.

Discussion

The results do not confirm Ferguson's impression that Ritalin is of value in the treatment of chronic schizophrenia but they are in line with the controlled trials of Clark *et al.* (1956) and of Carey *et al.* (1956). On the other hand the results confirm the conclusion of several controlled studies that chlorpromazine is of some definite value (Vaughan *et al.*, 1955; Feldman *et al.*, 1956; Shepherd and Watts, 1956). In particular our findings agree with those of Shepherd and Watts and of Rockmore *et al.* (1956) that chlorpromazine is useful in apathetic schizophrenic patients; this is in contradistinction to such studies as those of Azima and Ogle (1954) who found the drug to have no useful effect in non-excited schizophrenics. Our figures did not show any significant improvement on chlorpromazine in the symptoms listed as "emotional outbursts" and "impulsive behaviour"; this is in agreement with Mitchell (1956) who found no difference between the number of "aggressive incidents" in chronic schizophrenic patients receiving chlorpromazine and those acting as controls.

A study of Table I suggests that chlorpromazine brought about improvement chiefly by reducing the severity of those symptoms that prevent the schizophrenic patient making social contact with other people; in particular, the coherent use of language was improved. This supports a common impression. Thus Vaughan *et al.* (1955) found that the basic schizophrenic symptoms were little influenced by chlorpromazine and that its main beneficial effect lay in better rapport and socialization; Azima and Ogle (1954) thought that chlorpromazine induces "a sense of decorum" in schizophrenic patients; Newbold and Steed (1956) considered that, by reducing emotional tension, the drug enabled the patient to communicate his thoughts more freely; while Rockmore *et al.* (1956), estimating by a controlled trial the effects of chlorpromazine on a hundred items of behaviour in chronic schizophrenics, found that the items showing significant improvement were those concerned with overactivity, communication and socialization.

Fullerton (1956) has recently shown by a controlled trial that the stimulant drug pipradol (Meratran) is apparently of no value in chronic schizophrenia and he refers to similar studies by other workers. These findings, together with those of the present study, tend to confirm the general view that central nervous stimulants are not of benefit in schizophrenia, but that drugs with a central depressant action may be so. This is of some theoretical interest because it suggests that the chronic schizophrenic suffers, not so much from a lack of drive, as from a higher inhibition which prevents him making use of his energies.

SUMMARY

1. A self-controlled, double-blind clinical trial of Ritalin, at two dosage levels, and of chlorpromazine was made in 48 chronic schizophrenic patients.

2. Compared with the control period, patients on Ritalin (at both dosages) showed no significant difference in behaviour or in the severity of their symptoms.

3. On chlorpromazine, however, a significant number of patients were improved, as compared with the control, in eight of the eighteen symptoms rated; behaviour also tended to improve, though taken singly none of the seven aspects of behaviour examined showed a significant degree of improvement.

4. The symptoms which showed most marked improvement with chlorpromazine were those concerned with sociability and the social use of language.

ACKNOWLEDGMENTS

We thank Ciba Limited for supplying the "Ritalin" powder, and May & Baker Limited for supplying the control syrup (matched to simulate the taste of "Largactil" syrup by the addition of quassin) and the syrup in which the "Ritalin" powder was dissolved. We also thank Miss Lumb, chief hospital pharmacist, and the nursing staff for their close co-operation; and Dr. T. P. Rees, Medical Superintendent, for his interest and encouragement.

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6β-HYDROXY-3:5-*CYCLO*PREGNAN-20-ONE IN MENTAL STATES

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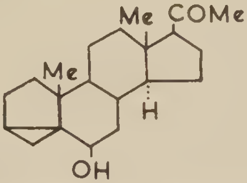
SOME years ago we began to evaluate steroidal compounds in the treatment of mental states and now report some results obtained with 6β-hydroxy-3:5-*cyclo*pregnan-20-one (I), the most promising of the compounds studied.



It seems likely that normal steroidal production by the body is associated with mental health and conversely that inadequate production may predispose to altered mental states (cf. Ciba Foundation Colloquia, 1952). An extreme example of this effect is evident in Addison's disease in which destruction of the adrenal cortex with consequent disappearance of adrenal steroids leads to apathy, mental depression and frank psychosis (see for example, Cleghorn, 1951; Engel and Margolin, 1941) which are alleviated by the administration of adrenal cortical extract (Hartman, 1935). The effect of slightly lowered steroid levels upon mental states is naturally more difficult to establish. Pincus, Hoagland and their collaborators (Pincus *et al.*, 1949; Hoagland, 1953) however, have presented impressive evidence to show that dysfunction of the adrenal cortex, as measured by urinary steroids, is often present in psychotic patients. Schizophrenics appear to show subnormal adrenal responsivity to stress and to injected A.C.T.H., but do not exhibit typical Addisonian symptoms, a result which points to "a species of hypo-adrenalism occurring characteristically in the psychotics". The possibility of treating mental states by some form of replacement therapy is thus apparent. Criteria for recognizing such states, however, are not available at present. This fact enforces an empirical approach to the selection of patients for treatment and to the choice of steroid employed.

METHOD

Preliminary Investigation

Ten patients (2 males and 8 females with ages ranging from 30 to 76) were selected, mostly from the chronic population of a mental hospital. Four patients came into the category of catatonic forms of schizophrenia, 2 paranoid forms of schizophrenia, 2 schizophrenics who had previously had prefrontal leucotomies and 2 patients suffering from senile dementia. The patients were divided, as far as possible, into two similar groups with regard to diagnosis, sex and age. The steroid (I) and the placebo material were made up in the form of identical 100 mg. tablets known to us only by the code numbers TS.658 and TS.659.* Each patient received 1 tablet three times a day, corresponding to a daily dose of 300 mg. After 15 days, treatment was reversed, the group on TS.658 receiving TS.659 and *vice versa*. Each patient received, on the average, 15 days' treatment.

The 2 male cases showed no essential changes during and after treatment.

Four female patients out of the 8 showed marked improvement in their subjective mental condition when put on TS.658, with relapse when the treatment was changed to TS.659. The relapse occurred 7 to 15 days after reversal of the treatment. Improvement was noticed in 1 catatonic patient aged 36, 1 chronic schizophrenia paranoidal type aged 67, 1 senile dementia case aged 76 and 1 post-prefrontal leucotomy patient aged 47.

We concluded from these results that TS.658 contained the active substance and TS.659 the placebo. This was checked and found to be the case. We therefore went ahead with more extensive trials on the steroid (I).

Main Series

The patients were selected at random from a Psychiatric Out-patient Department. The steroid (I) was administered, as before, in 100 mg. tablets three times a day. No attempt was made to follow the patients' progress by objective testing. Frequent interviews and subjective accounts by the patients were the only guides used for the assessment of patients' mental changes. The exact expressions used by the patients are reported when possible.

Case No. 1. E.W., female, age 35, married.

Diagnosis. Depressive state with obsessive features.

Recent sudden onset of illness, as far as could be assessed, of not more than 4 weeks duration.

The first symptom of which she became aware was excessive worry. The progress of her domestic work was extremely hampered by checking and re-checking of each step, it finally becoming altogether impossible for her to complete her tasks. At the same time she became preoccupied by suicidal fantasies, but denied having ever experienced the impulse actually to commit suicide. Her sleeping rhythm deteriorated. She found it extremely difficult to fall asleep in the early part of the night and, when asleep, would wake suddenly in a panic. The patient's family history revealed that its various members suffered from a variety of minor neurotic symptoms.

Treatment was commenced on 22 August, 1955. After 21 days patient reported: "I am feeling much better, less depressed, but still lacking somewhat in confidence." This initial improvement did not last, however, the patient relapsing for a short period. She improved again and, after 2 months of treatment, was well enough to be discharged as fully recovered.

Case No. 2. E.E.S., female, age 34, married.

Diagnosis. Depressive state with obsessive suicidal and homicidal fantasies.

The patient had a good insight into her condition and could give an excellent account of her symptoms. It was difficult to assess the exact date of the onset of her illness, which was apparently of rather long duration.

The patient commenced treatment on 12 August, 1955. After only 6 days of treatment she reported that she was much better, more settled and less depressed. She remarked that her obsessive ideas were still present but were in the background and did not interfere with her normal life. The patient voluntarily added that she had felt better in the last week than for the last 10 years.

The patient made an uneventful recovery and was discharged on 4 November, 1955, free of complaints and able to resume her normal occupations.

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* TS.658≡6β-hydroxy-3:5-*cyclo*pregnan-20-one ("neurosterone").

Case No. 3. W.N., female, age 37, single.

Diagnosis. Anxiety state.

The illness was of very long duration. The patient was always a rather shy, solitary person, a poor mixer, rather sensitive and suspicious. As a child, she was nervous and given to day-dreaming, which persisted through adolescence into maturity. In childhood she showed frequent somatic manifestations such as stomach-ache before visits, etc. The family history was not very satisfactory; her mother was a cyclothymic.

Treatment was commenced on the 12 August, 1955. Six days later the patient reported that she was able to relax and to settle down to reading, and become aware that her thinking was much clearer. On the 9 September the patient reported: "I think that the brown tablets (i.e. the steroid) have done me good, I feel a great deal better." On 21 October she repeated more or less her previous observation, but added on this occasion that she could not do without the tablets. It might be of some interest to report another observation by the same patient that she noticed the improvement three-quarters to one hour after taking the tablets. At present the patient attends the clinic only occasionally.

Case No. 4. G.P., female, age 34, married.

Diagnosis. Anxiety hysteric.

The onset was gradual and the illness, as far as we could assess, was of very long standing. The patient's condition became aggravated about August, 1954, following the death of her friend from a brain tumour. The patient started to complain of general lassitude, difficulty in breathing, headaches and sudden attacks of claustrophobia.

Treatment was commenced on 21 September, 1955, and continued for about 1 month. There was no response.

Case No. 5. V.M., female, age 28, single.

Diagnosis. Anxiety hysteria.

The illness was of very long duration. The patient had various complaints such as headache, backache, stuffiness in the nose, salivation, frequent feeling of sickness and occasional vomiting. An immature personality, she was unable to maintain a job for any length of time.

Treatment was commenced on 20 July, 1955. On 10 August, the patient reported that she was feeling much better and was able to go out alone, which she had not been able to do for a long time. No great importance could be attached to this fact, however, as the patient was not a reliable witness and there were no doubt occasions in her history when she was free from symptoms. She reported a complete relapse at subsequent interviews. Treatment was discontinued on 21 September; the patient had not improved.

Case No. 6. D.H., female, age 53, married.

Diagnosis. Anxiety hysteria.

A rather immature personality. Her illness came on suddenly in January, 1954. The main symptoms of which she complained at the time were pains in the chest and right arm and breathing difficulties. The patient's own interpretation of these symptoms was that she was suffering from TB of the chest and spine. Although all physical examinations were negative, she remained unconvinced that she had not got TB and stayed in bed for more than 6 weeks.

Treatment was commenced on 18 August, 1955 and was abandoned 21 days later as there was no response.

Case No. 7. V.D.C., female, age 39, married.

Diagnosis. Anxiety state.

The illness was long standing with depressive features. The depressions were never severe enough to warrant hospital or other treatment such as E.C.T.

Treatment was commenced on 28 August, 1955. The patient's condition rapidly deteriorated and she became acutely depressed and agitated. On 1 October, 1955 immediate admission to a mental hospital became necessary as there was a possibility of the patient becoming suicidal. Steroid therapy was withdrawn and the patient treated with E.C.T. following which she made a good recovery.

It is thought unlikely that the steroid played a part in the patient's mental deterioration.

Case No. 8. R.D., male, age 35, married.

Diagnosis. Anxiety state.

The illness was of long standing. Its onset was difficult to assess, but the patient's condition had gradually been deteriorating for the past 4 years. The patient's main complaints were tenseness, inability to concentrate and muddle-headedness. He also complained of severe insomnia, mostly in the early part of the night. His personality, according to the patient's own description, was of the "worrying type" and his general outlook was pessimistic, always seeing danger where none existed.

Treatment was commenced on 9 September, 1955. On 21 October the patient reported in a somewhat elated mood: "Since the tablets I am champion." He reported that he was more settled, less worried, less fatigued during the day and sleeping better during the night.

A fortunate mistake occurred at this stage when the patient was given different tablets in lieu of the steroid by the local dispenser. He relapsed shortly afterwards showing his former symptom. Although unaware of the mistake, he noticed a sudden change for the worse. He improved again when the mistake was discovered and corrected.

The patient is occasionally being followed up in the out-patient clinic.

Case No. 9. D.H., male, age 31, married.

Diagnosis. Anxiety state.

The illness had an acute onset in 1952. The immediate apparent cause was an unfortunate family experience when his wife, to whom he was devoted, developed an acute schizophrenic illness and had to be admitted to a mental hospital. He became extremely depressed, irritable and worried about himself. He was unable to dismiss from his mind the image of his wife when acutely ill prior to her admittance to a mental hospital. He had a good previous personality.

Treatment was commenced on 7 September, 1955. Fourteen days later the patient reported that he was feeling much happier, less irritable, less aggressive and able to concentrate better. He maintained his improvement and was discharged on 14 December, 1955.

Case No. 10. H.D., male, age 34, married.

Diagnosis. Compulsive, obsessive neurosis and depressive features.

The illness was long-standing. The patient was an intelligent man with a university education. The content of his obsessions was the fear that he might tread and injure insects or small animals. He felt compelled, when walking in the street, to look constantly on the ground in order to avoid small creatures. Many times he had to go back a considerable distance to check whether he had not done so.

Treatment was commenced on 29 July, 1955. On 10 September the patient reported improvement. He was able to walk more freely. Although he had not lost his obsessive ideas they appeared to be easier to manage. He was less depressed. On 14 December the patient had still maintained his improvement. He is being followed up at present.

DISCUSSION

Statistically significant results can necessarily not be drawn from such a limited number of cases. It seems likely, however, that 6β-hydroxy-3:5-*cyclo*-pregnan-20-one (I) may be of value in the treatment of a variety of mental states with the exception of those grouped under anxiety hysteria in the present series. We have the impression that administration of the material is not entirely a form of substitution therapy, as the improvements produced appear to be maintained after withdrawal of the steroid. It is tempting to ascribe this to the establishment of more normal steroidogenesis as a result of treatment (cf. Kappas *et al.*, 1956). An encouraging feature of the present trials was the apparent absence of side-effects in the patients receiving the steroid. A wider evaluation is being planned.

SUMMARY AND CONCLUSIONS

The results show that 6β-hydroxy-3:5-*cyclo*pregnan-20-one (I) is of some value in the treatment of mental states.

The observations made appear to indicate that the steroid influences a variety of mental states extending beyond and not keeping strictly to the conventional psychiatric classifications, ranging from the organic on the one side, to the purely psychogenic mental conditions on the other.

The steroid seems to increase the general ability of the patients to cope more satisfactorily with their symptoms. To this extent the effect produced falls probably into the same category as that termed "anti-fatigue" by Hoagland and Pincus.

Patients grouped in the present series under anxiety hysteria failed to respond to treatment.

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THE CONTROL OF VISUAL IMAGERY IN MENTAL DISORDER

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INTRODUCTION

In this paper are presented the results of a further stage in the work started by Gordon (1950), added to by Petrie (1952) and continued by Costello (1956). In her first investigation Gordon found that two different kinds of imagery processes existed on the basis of which people could be divided into two contrasting groups. "On the one hand there were people whose imagery tended on the whole to be 'autonomous' that is to say, the images which they experienced were relatively independent of any volitional control that they might wish to exert . . . The other group, in contrast, consisted of persons whose images appeared to be part of a more or less integrated functioning of personality so that the nature, appearance and disappearance of these images was under the conscious control of the subject."

In her second investigation Gordon set out to find some more objective criteria which might corroborate the differentiation of imagery processes. She found a significant correlation between the type of imagery of a person and the ability to control the rate of reversal on the Necker Cube so that the subject whose imagery was relatively controlled was capable of exerting more volition in relation to rate of reversal than the autonomous imagery type.

Petrie found that there was an increase in reversals, especially willed reversals, on the Necker Cube after her subjects had been leucotomized and related this to Gordon's work. She suggested that the patients were better able to control their imagery after operation.

Costello in his study on the effects of pre-frontal leucotomy obtained data suggesting a centralizing tendency after operation on two space tests. It was also found that when a group of normal subjects were divided into two groups on the basis of their performance on the Gordon test of imagery those with controlled imagery did better on the space tests than those with autonomous imagery. The following explanation was proposed for the centralizing tendency after operation on the space tests: "patients who before leucotomy scored low on the space tests had vivid autonomous imagery which was made weaker and more controlled by the operation thus resulting in a higher post-operative score. Secondly, patients who had high scores before the operation had weak controlled imagery which was made weaker by the operation. The drop in score for these patients is apparently due to the fact that, though their imagery is controllable, it is now too weak for the images to be formed easily." Data was also obtained in support of Gordon's findings relating the type of imagery —autonomous or controlled—to the ability to control the rate of reversal on the Necker Cube.

It was felt that this controlled-autonomous continuum of visual imagery was worthy of further study and it was decided to investigate the relationships between the continuum and mental disorder. The two questions it was hoped to answer were:

1. Are there any differences between the Dysthymic and Hysteric groups of patients in their ability to control their visual imagery?
2. Are there any differences between Normals and Neurotics in their ability to control their visual imagery?

METHOD

Twenty dysthymics, twenty hysterics and twenty normals were tested. The data relating to age, sex, intellectual capacity and verbal ability are presented in Table I.

TABLE I

Data on Age, Sex, Intellectual Capacity and Verbal Ability
(n=20 in each group)

Group	Age in Years	Sex (No. of Subjects)		Matrices Raw Score	Mill Hill Vocabulary Scale Raw Score
	Mean	M	F	Mean	Mean
Dysthymics ..	39·55	10	10	34·25	49·4
Hysterics	34·55	10	10	37·25	43·85
Normals	22·10	6	14	47·25	48·9

The two neurotic groups do not differ significantly in age, Matrices score or vocabulary score. The normal group is significantly younger than the two neurotic groups and gets a significantly higher mean score than the two neurotic groups on the Matrices test. The bearing these differences have on the rest of the data will be discussed later. The groups will now be described in more detail.

The 20 Normal Subjects

The normal group consisted of members of the nursing staff of St. George's Hospital with one exception, this being a fourth-year medical student. They were requested to avoid discussing their interviews with their friends. Apart from the fact that they were not given a Rorschach test, the procedure adopted for them was exactly the same as for the neurotic groups.

The 40 Neurotic Subjects

All the neurotic subjects were in-patients at St. George's Hospital or out-patients at one of the clinics served by the hospital. The Consultant Psychiatrists were asked to refer all neurotic patients who could be classified as dysthymics or hysterics. No patient was used who had any evidence or history of psychotic features, brain injury or epilepsy or who had received any form of psychosurgery. No patient was used who had started E.C.T. or insulin.

The patients were included in the dysthymic group if they could be diagnosed as having one or more of the following characteristics: manifest anxiety, reactive depression, obsessive compulsive features. They were included in the hysteric group if the psychiatrist could diagnose them as having one or more of the following characteristics: hysterical personality, conversion symptoms, hysteria, psychopathic personality.

All the patients were given the Rorschach which was administered, scored and interpreted according to the method described by Klopfer (1954). There was complete agreement between the classification—dysthymic or hysteric—decided upon by the psychiatrist and that based on the Rorschach results. Though the Experience Balance was given considerable weight when deciding into which group the subject should go it was decided that at this stage of the research on the control of visual imagery, no attempt should be made to minimize overlap between the neurotic groups along the dimension of introversion–extraversion by the use of Scales such as Guilford's R Scale (1942).

All the patients were co-operative throughout the testing.

Procedure

All the subjects were seen at two sessions, both sessions taking place within the same week. During the first session all the subjects were given the Matrices test and the Mill Hill Vocabulary Scale. These tests were followed by the Rorschach test in the case of the two neurotic groups.

During the second session all the subjects were first of all given the N.I.I.P. space test (Group Test 80A). The instructions of the National Institute of Industrial Psychology were followed closely in the administration of the test. It is felt however that by giving the test individually a better understanding of what he had to do was obtained by the subject during the sample tests than is the case when the test is administered to a group.

The space test was followed by the Necker Cube. A card on which was drawn the reversible box pattern was presented to the subject and the reversal of perspective was described to him until it was felt that he had grasped the idea. He was then told to look at the card for one minute and to tap the table with a pencil each time he noted a change in his perception of the drawing. The rate of reversal during this minute was taken as the subject's normal rate. The subject was next instructed to attempt to increase the number of reversals per minute as much as he could, tapping each time there was a change of perspective. Finally the subject was told to reduce the number of reversals per minute as much as he could, again tapping each time he noted a change in his perception.

The subject was then given a standard interview on visual imagery and related processes. At the beginning of the interview the nature of visual images was described to him and illustrated, distinctions such as that between remembering well what a person looked like and getting a visual image of the person being pointed out to him. The remainder of the interview included the Gordon test of visual imagery and questions on autonomous imagery, hypnogogic imagery and dreams. The Gordon test will be described in full. When it was felt that the subject had a clear idea of what was meant by a visual image he was asked to close his eyes and try to get a visual image of the following scenes, simply saying "Yes" if he could get an image of the scene and "No" if he could not:

1. A car standing in front of a garden gate.
2. The same car but in a different colour from that seen at first.
3. The same car lying upside down.
4. The same car back on its four wheels.
5. The car running along the road.
6. The car climbing up a very steep hill.
7. Climbing across the top of the hill.
8. Getting out of control and crashing through a house.

9. The same car running along the road with a handsome couple inside.
10. Crossing a bridge and falling into the stream below.
11. The same car all old and dismantled standing in a car cemetery.

An attempt was made immediately afterwards to discover why the subject had failed in the case of his failures and to discover if he had any difficulty with any of the scenes he had finally managed to image.

RESULTS

Neurotic Groups

In Table II the results on the space tests and the Necker Cube for the two Neurotic groups are presented.

TABLE II

The Mean Scores on the N.I.I.P. Space Test and the Necker Cube for the Dysthymics and Hysterics with the "t" and "p" Values for the Difference between the Means (n=20 in each group)

Group	N.I.I.P. Raw Score	Necker Normal Score	Necker Fast Score	Necker Slow Score	Necker Fast-Normal Score	Necker Fast-Slow Score
	Mean	Mean	Mean	Mean	Mean	Mean
Dysthymics ..	24·7	10·75	16·7	5·8	7·1	12·05
Hysterics ..	20·4	16·55	23·9	9·6	7·9	14·8
	t=1·16 p=>·05	t=2·97 p=<·01	t=1·87 p=>·05	t=2·70 p=<·05	t=·26 p=>·05	t=·78 p=>·05

From the data presented in Table II it can be concluded that:

1. The difference between the dysthymics and hysterics in their performance on the N.I.I.P. space test is not significant.
2. The hysterics' normal rate of fluctuation on the Necker Cube is significantly higher than that of the dysthymics.
3. The difference between the dysthymics and hysterics in their fast rate of fluctuation on the Necker Cube is not significant.
4. The dysthymics' slow rate of fluctuation on the Necker Cube is significantly lower than that of the hysterics.
5. The two groups do not differ significantly in their ability to vary the rate of reversal as assessed by the differences between the fast rates and normal rates and between the fast rates and slow rates.

It was found that thirteen of the twenty dysthymics were unable to visualize all the scenes in the Gordon test according to their reports and seven were able to do so. Ten of the hysterics were unable to visualize all the scenes and the other ten were able to do so. But it was also found that with one exception there was a clear difference between the kind of difficulty experienced by the dysthymics and the kind experienced by the hysterics. The thirteen dysthymics who failed on one or more of the scenes had vivid imagery of an autonomous kind, e.g. a vivid picture of a car that would not turn over or that would not go up the hill—"I saw the car and the hill clearly but the car just stayed at the bottom." Or a car that would not crash into the house—"The car kept going by the house and I could not get it to crash." Only one of the hysterics reported this kind of difficulty. The other nine hysterics who failed on one or other of the scenes reported weak imagery of an unstable kind, e.g. "The car kept coming and going", "I could see the car but not the house." "I could only see the car at first—then I saw the house but the car faded away." "I could see a car but I could not see the couple inside it." Two of the hysterics said they could not see the car at all.

It was decided to bunch the two neurotic groups together and to see if there were any differences in performance on the tests between the following groups: the vivid-autonomous group (consisting of the fourteen patients—13 dysthymics and 1 hysteric—who had strong visual images which they could not manipulate); the weak-unstable group (consisting of the nine patients—all hysterics—who had no visual images or weak ones which they found hard to hold); the controlled group (consisting of the remaining seventeen patients—7 dysthymics and 10 hysterics—who were able to visualize all the eleven scenes).

TABLE III

The Mean Ages and Mean Scores on the Matrices, Vocabulary Scale, N.I.I.P. Space Test and Necker Cube for the Vivid-autonomous Group and Controlled Group with the "t" and "p" Values for the Differences between the Means

Group	Age	Matrices Raw Score	Mill Hill Vocabulary Scale Raw Score	N.I.I.P. Raw Score	Necker Normal Score
	Mean	Mean	Mean	Mean	Mean
Vivid-autonomous	34·5	37·93	46·07	21·93	9·71
Controlled	41·29	34·29	50·41	28	13·76
	t=1·54 p=>·1	t=·89 p=>·3	t=1·13 p=>·2	t=1·39 p=>·05	t=2·137 p=<·05

Group	Necker Fast Score	Necker Slow Score	Necker Fast-Normal Score	Necker Fast-Slow Score
	Mean	Mean	Mean	Mean
Vivid-autonomous	13·36	5·429	3·64	8·64
Controlled	23·47	7·295	9·70	16·11
	t=3·00 p<·01	t=1·381 p>·1	t=3·08 p<·01	t=2·37 p<·05

From the data presented in Table III it can be concluded that:

1. The differences between the two groups in age, intellectual capacity and verbal ability are not significant.
2. The difference between the two groups in their performance on the space test is not significant.
3. The controlled group's normal rate of fluctuation on the Necker Cube is significantly higher than that of the vivid-autonomous group.
4. The controlled group's fast rate of fluctuation is significantly higher than that of the vivid-autonomous group.
5. The difference between the two groups in their slow rate of fluctuation is not significant.

6. The controlled group are better able to vary the rate of fluctuation than the vivid-autonomous group, the difference between the means being significant for the fast-normal scores and the fast-slow scores.

TABLE IV

The Mean Ages and Mean Scores on the Matrices, Vocabulary Scale, N.I.I.P. Space Test and Necker Cube for the Weak-Unstable Group and Controlled Group with the "t" and "p" Values for the Differences between the Means

Group	Age	Matrices Raw Score	Mill Hill Vocabulary Scale Raw Score	N.I.I.P. Raw Score	Necker Normal Score	Necker Fast Score	Necker Slow Score	Necker Fast-Normal Score	Necker Fast-Slow Score
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Weak-unstable	32·78	35·11	40·33	13·22	19·55	27·67	13·11	8·11	14·55
Controlled ..	41·29	34·29	50·41	28	13·77	23·47	7·29	9·70	16·11
	t=1·96	t=·023	t=2·563	t=2·905	t=2·233	t=·652	t=3·415	t=1·138	t=·328
	p> ·05	p> ·9	p<·02	p<·01	p<·05	p> ·05	p<·01	p> ·05	p> ·05

From the data presented in Table IV it can be concluded that:

1. The difference between the two groups in age, and in intellectual capacity is not significant but the controlled group have a significantly higher vocabulary score than the weak-unstable group.
2. The controlled group's performance on the space test is significantly better than that of the weak-unstable group.
3. The weak-unstable group's normal rate of fluctuation on the Necker Cube is significantly higher than that of the controlled group.
4. The difference between the two groups in their fast rate of fluctuation is not significant.
5. The controlled group's slow rate of fluctuation is significantly lower than that of the weak-unstable group.
6. The difference between the two groups in their ability to vary the rate of reversal is not significant.

From the data presented in Table V it can be concluded that:

1. The difference between the normals and the dysthymics and the normals and hysterics in their performance on the space test is not significant.
2. The normal group's normal rate of fluctuation on the Necker Cube is significantly higher than that of the dysthymics but is not significantly different from that of the hysterics.

3. The normals' fast rate of fluctuation is significantly higher than that of the dysthymics and hysterics.
4. The normals' slow rate of fluctuation is significantly higher than that of the dysthymics but is not significantly different from that of the hysterics.
5. The differences between the normals and dysthymics and the normals and hysterics in their ability to vary the rate of reversal from normal to fast rates is not significant.
6. The differences between the normals and dysthymics in varying the rate of reversals from fast to slow speeds is significant—the normals having a larger difference between fast and slow scores. The differences between the normals and hysterics is not significant.

Differences Between the Normal Group and the Neurotic Group

TABLE V

The Mean Scores on the N.I.I.P. Space Test and the Necker Cube for the Normals, Dysthymics and Hysterics with the "t" and "p" Values for the Differences between the Means

Group	N.I.I.P. Raw Score	Necker Normal Score	Necker Fast Score	Necker Slow Score	Necker Fast-Normal Score	Necker Fast-Slow Score
	Mean	Mean	Mean	Mean	Mean	Mean
Normals ..	27·05	22·0	33·95	10·15	13·0	24·3
Dysthymics ..	24·7	10·75	16·7	5·8	7·1	12·05
	t=·586 p>·05	t=4·068 p<·01	t=3·762 p<·01	t=2·69 p<·02	t=1·586 p>·10	t=2·505 p<·05
Normals ..	27·05	22·0	33·95	10·15	13	24·3
Hysterics ..	20·4	16·55	23·9	9·6	7·9	14·8
	t=1·88 p>·05	t=2·086 p>·05	t=2·018 p>·05	t=·304 p>·05	t=1·402 p>·05	t=1·831 p>·05

It was found that thirteen of the normal subjects were able to visualize all the eleven scenes in the Gordon test, two had vivid-autonomous imagery and five had weak-unstable imagery. As a further test of the relationships between control of imagery and performance on the space test and Necker Cube it was decided to combine the normals and hysterics and to compare the performances of the subjects with controlled imagery and those who had weak-unstable imagery.

TABLE VI

The Mean Scores on the N.I.I.P. Space Test and the Necker Cube for the Weak-Unstable Group and the Controlled Group (combining the Normals and Hysterics)

Group	N.I.I.P. Raw Score	Necker Fast-Normal Score	Necker Fast-Slow Score
	Mean	Mean	Mean
Weak-unstable ..	14·40	7·19	13·86
Controlled	30·57	13·61	24·57
	t=6·876 p<·01	t=1·656 p>·05	t=2·072 p<·05

From the data presented in Table VI it can be concluded that:

1. The controlled group's performance on the space test is significantly better than that of the weak-unstable group.
2. The difference in their ability to change from normal to fast rates of fluctuation is not significant.
3. The controlled group is significantly better able to change from fast to slow speeds.

In view of the fact that the normals were significantly younger than the two neurotic groups and got significantly better scores on the Matrices and yet did not perform significantly better on the space test it was decided to calculate the coefficients of correlation between age and N.I.I.P. scores and between Matrices scores and N.I.I.P. scores for the normals and dysthymics and normals and hysterics.

Table VII

Coefficients of Correlation between Age and N.I.I.P. Space Test Scores and Matrices Scores and N.I.I.P. Space Test Scores for the Normals and Dysthymics and Normals and Hysterics taken separately

Group		N.I.I.P.	
Normals Dysthymics	Age	—·2084	p> ·05
	Matrices	·5067	p< ·01
Normals Hysterics	Age	—·1186	p> ·05
	Matrices	·4976	p< ·01

From the data presented in Table VII it can be concluded that:

1. There is a significant positive correlation between the Matrices scores and space test scores.
2. There is an insignificant negative correlation between age and space test scores.

The data from the standard interview, apart from the Gordon test, was not in a form that could be statistically or systematically analysed and will be presented during the discussion of the test results already presented.

Discussion and Conclusions

One of the most interesting of the findings is the distinction between people who are unable to control their imagery because their images are vivid and of an autonomous nature and those who cannot control their imagery because their images are weak and of an unstable nature. The data from the Gordon test suggests that the first type of imagery is associated with dysthymic disorders and the second type with hysteric disorders. That mental disorder is not a necessary concomitant of inability to control imagery processes is clear from the amount of overlap between the normal and neurotic groups. It may however be a contributory factor and certainly would seem to play a role in determining the kind of mental disorder to which the individual is prone.

This difference between the autonomous type and the unstable type as compared with the controlled type is not based solely on the Gordon test since we have shown that previous work relating the distinction to control of fluctuation on the Necker Cube has been substantiated and in the case of comparison between the weak-unstable group and controlled group is also reflected in performance on the N.I.I.P. space test—the weak-unstable group not doing so well as the controlled group.

Inability to control images is reflected in an inability to vary the rate of reversal on the Necker Cube. A further analysis of the data suggests that other measures may indicate to which group—the vivid-autonomous or weak-unstable—the individual belongs.

The vivid-autonomous group has a significantly lower normal rate of reversal than the controlled group whereas the weak unstable group has a significantly higher normal rate of reversal than the controlled group. The vivid-autonomous group has a significantly lower fast score than the controlled group whereas the difference between the weak-unstable group and the controlled group on this measure is not significant. There is no difference between the vivid-autonomous group and the controlled group in their ability to reduce the number of reversals (slow score) but the weak-unstable group shows a significantly higher mean slow score than the controlled group.

These findings suggest that the weak-unstable group have generally faster rates of reversal than the vivid-autonomous group. If this is the case, then we would expect a difference between the dysthymics and hysterics in absolute rates of reversal—the hysterics having a faster rate of reversal. This is what we find (Table II). It will be seen that they do not differ significantly in their ability to vary the rate of reversal but the differences on the normal and slow scores are significant. There is no difference between their mean scores on the N.I.I.P. This would be expected since both groups have difficulty in the manipulation of their visual images.

It was found that the normal group used here was most like the hysteric group in that five of the subjects had weak-unstable imagery as assessed by the Gordon test and only two vivid-autonomous imagery. This reflected in the fact that three of the differences on the Necker Cube for the dysthymics and normals are significant whereas none of the differences on the Necker Cube for the hysterics and normals are significant. When the normals are compared with the two neurotic groups in their ability to vary the rate of reversal it is found that though their scores are higher in every case only one is significant, that between the mean fast-slow scores of the dysthymics and the normals. This again suggests that the type of imagery indicates more the type of disorder to which the individual may be prone rather than indicating mental disorder itself. This probably accounts in part for the fact that differences between the two neurotic groups and the normal group on the space test are not significant. In view of the fact that the normal group was significantly different from the two neurotic groups in scores on the Matrices along with the fact that there is a significant positive correlation between the Matrices score and the N.I.I.P. score one might perhaps have expected significant differences between the groups due to difference in intellectual capacity. The investigator can find no adequate reasons for this though the negative correlation between age and the N.I.I.P. scores, though insignificant for the samples studied, may be worth further investigation.

The data from the standard interview did not reveal any differences between the normals, dysthymics and hysterics or between the vivid-autonomous, weak-unstable and controlled groups in the incidence of dreams reported or the nature of the dreams. None of the subjects claimed a photographic memory or remembered instances of visual phenomena under the effects of anaesthesia or instances of hypnogogic visual imagery. Only one of the subjects remembered a clear-cut instance of autonomous visual imagery. She was a young girl complaining of anxiety and depression and who belonged to the vivid-autonomous group. She had on numerous occasions had a vivid picture of children falling. She tried to see herself saving them but could not do so. This lack of significant data with respect to dreams, hypnogogic imagery, etc. suggests that they are not directly related as was previously thought (1956) to the daytime visual images studied here.

The findings presented would seem to fit in with the theory of cortical inhibitory and excitatory processes described by Pavlov (1941) and Eysenck (1955). Whether or not vivid images do correspond to a predominance of excitatory processes and weak images to a predominance of inhibitory processes is the next problem to be investigated. In this connection work has already started on the relationships between the alpha rhythm of the EEG and the vividness of visual imagery.

SUMMARY

1. Twenty dysthymics, 20 hysterics and 20 normals were given a standard interview on visual imagery and related processes which included the Gordon test of visual images. They were also given the N.I.I.P. space test and the Necker Cube.

2. The data suggests that individuals can be divided into three groups: (*i*) a controlled group the members of which are able to control their visual images; (*ii*) a vivid-autonomous group whose images are vivid and hard to manipulate; (*iii*) a weak-unstable group whose images are weak and not easily held.

3. The data suggests also that the groups differ in their ability to control the rate of fluctuation on the Necker Cube and the controlled group do significantly better than the weak-unstable group on the N.I.I.P. space test.

4. It would seem that mental disorder is not a necessary concomitant of inability to control visual images but the nature of an individual's visual images would seem to indicate the kind of mental disorder to which he is prone—vivid-autonomous imagery being associated with dysthymic disorders, weak-unstable imagery with hysteric disorders.

5. The general significance of the results is discussed.

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SOME EFFECTS OF NALORPHINE ON THE BEHAVIOUR OF HEALTHY HUMAN VOLUNTEERS

By

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SOME workers have claimed that nalorphine is as potent an analgesic as morphine and does not lead to addiction.

Lasagna and Beecher (1954) found that, in patients after operation, 15 mg. nalorphine hydrochloride had approximately the same analgesic effect as 10 mg. morphine. This dose, however, produced unpleasant mental side-effects in some patients and six healthy male volunteers given 10 mg. of the drug became sleepy, dizzy and nauseated, and showed evidence of mental change.

Huggins and Moyer (1955) reported that twenty-three out of thirty patients, given nalorphine without the previous administration of morphine or a similar analgesic, experienced hallucinations.

Keats and Telford (1956) found that nalorphine was at least as potent an analgesic as morphine post-operatively and went so far as to say that it represents a long-sought potent non-addicting analgesic. They did, however, think that it might be more liable than morphine to produce side actions.

The possibility of the existence of a potent non-addictive analgesic warranted further investigation; but, in view of reports of serious side effects, it was thought wise, before attempting a clinical trial, to determine on healthy volunteers the ability of nalorphine to raise the pain threshold and, at the same time, to investigate the incidence of side-effects.

METHODS

Selection of Volunteers

Sixteen students who had recently taken part in an experiment to determine the ability of dipipanone hydrochloride to raise the threshold to ischaemic pain, and for whom controls were therefore readily available, were asked to give their services for a similar experiment with nalorphine. The author also took part in the experiment.

Doses and Administration

Doses of 6·7 and 15·0 mg. were chosen for statistical convenience, and given by subcutaneous injection in a volume of 1·0 ml. The ampoules in which the drug was supplied were identical in appearance, and the volunteers were unaware of the doses used. Since the side-effects to be expected were not known, the low dose was always given first.

Procedure

The subjects attended the laboratory on days convenient to them. On the first two days of the experiment they attended in small groups of three or four; but the effects on behaviour were so marked on these occasions that they attended one at a time thereafter so that physical restraint, when necessary, would be easier.

The method of estimating the ability of nalorphine to raise pain threshold was based on that described by Keele (1952) using ischaemic pain.

When it became apparent that severe emotional disturbances and aberrations of behaviour were to be expected, a magnetic-tape sound recorder was made available so that sound recordings could be made throughout the experiment for analysis later.

On the first occasion on which the tape recorder was used it was installed in a soundproof room a few yards from the room in which the experiments were taking place. When a subject was behaving abnormally he was taken to the recorder and asked to record his subjective observations. This method, however, resulted in loss of spontaneity which outweighed the advantage gained by cutting out extraneous sound. The recorder was therefore transferred to the laboratory and equipped with a remote control switch which was operated by the author so that recording could begin immediately any abnormality of behaviour was observed. The quality of the recordings suffered as a result of the transfer of the recorder to a room which was not soundproof, and unfortunately, in the time available, it was not possible to devise a method by which the subjects were in complete ignorance of the fact that their speech was being recorded.

At the beginning of each experiment, before the drug was given, the subjects announced their names, ages, status, and habits regarding alcohol and tobacco. This short announcement then acted as a control with which later recordings could be compared.

RESULTS

The effect of 6·7 mg. nalorphine on the behaviour of the first subject was so dramatic that attention was immediately focused upon this aspect of the action of the drug rather than upon any analgesic activity it might possess. Indeed in the majority of subjects the effect of the drug on behaviour was such as to make estimations of rise in pain threshold quite unreliable.

In all thirty-three experiments were carried out on seventeen subjects. One subject, a Sinhalese, had a severe vaso-vagal attack after the low dose, and it was thought unwise to let him proceed to the high dose.

Fifteen minutes after injection of 6·7 mg. nalorphine the first subject began to laugh uncontrollably. He began to shout and insisted on imposing his opinions in a loud voice on everybody in his vicinity. He became extremely garrulous and his speech was incoherent. There was a marked increase in psychomotor activity and the subject made decidedly improper advances to three girls, having to be dragged off one of them. About an hour after injection he became hysterical and begged to be reassured that he would eventually return to normal. A quarter of an hour later he had an almost uncontrollable desire to go out in the street and expose himself and was most insistent that he should not be left alone.

The activity of the drug manifested itself in very marked waves during which the subject was fully aware that his behaviour was abnormal but was powerless to control it. His own written description of his experiences is quoted here verbatim.

"I have felt a slight derealized feeling suddenly in the Common Room. This continued until I was in the expt. room. I was seized by laughter and funny thoughts and had two readings when I was terribly amused. Garrulous. Time sense for readings and counting power lost. Came in waves. Saying things

I don't want to or ought not to. Awkward socially. I then felt as if I wanted to see people and they to see me. I went to buy my lunch tickets talking loudly with my keeper Dr. Cahal. Everyone turned and looked in the Hall of the School. I tried to make love to the lady at the desk and to a blonde bit in the Pharmacology dept.—pardon the expression madam. Everyone in the Pharm. dept. talked to me and I told them about the drug. Dr. Mogey wanted me to take a viva but I did not feel up to it in any way. Mike and Neville came and I talked to them. They did not respond to me as I would have liked. We had coffee—I told them I could kill someone and if this drug were used—I think this is important. I feel I have no soul. I suddenly got a shock that this feeling was my own Psychiatric disorder and would never end—all my inner personality came out. Almost wept but was reassured that this was the drug. Mike and Nev were annoyed at my garrulness. I decided to go and see Albert Hemingway and Prof. Durward—they stopped me. I went to the Bog in the Med. School and was garrulous in the corridor and assured a nice chap in the VIth yr that I was under the drug and not from the Tunbridge (a public house—D.A.C.). I am being to recover now. On returning I wanted to speak to a chap who works in the Med. School but decided he might think I was balmy. Feeling has worn off suddenly on writing this—went very quietly and suddenly. I do apologize to people of Pharmacology Dept. for any inconvenience caused by me whilst under this drug. Insistence of speaking—interrupt others sentences—very rude—I don't usually do it. Hear things very well. See v. well. Never lost conscious. Perfectly aware that I was being fool all the time but could do nothing about it. That's why Mike and Nev. annoyed me. I feel now as if I want to retrace my steps and apoligize. Slight frontal headache—somewhat tired and exhausted as if I have created a great artistic work. (Mike and Nev are ?? inhibited because of me making a fool of myself.) 11.15 Cannot remember how long I have been normal think it must have been at least since 10.50 because I tried to take a reading then—forgetting."

In contrast to this subject others were lethargic, depressed and averse to any form of physical activity. They lay around in chairs and on camp beds often apparently asleep, but all subjects who were affected in this way maintained that although they felt tired they were prevented from sleeping by flight of ideas, sometimes of a most bizarre character.

There was no obvious connection between the dose and the type of response elicited. Some were "elated" on the high dose and depressed on the low one, whilst the converse was true in other subjects. Again, some subjects experienced both elation and depression on the same dose on the same occasion.

Five subjects experienced waves of pathological laughter, one on the low dose only, two on the high dose only, and two on both doses.

Recall of very early childhood memories was reported quite spontaneously by four subjects. Others indulged in childish horseplay, and four other volunteers had to be physically restrained from open acts of hostility towards a senior member of the staff.

No hallucinations were reported but dream states in which vivid visual images were experienced when the eyes were closed were reported by three subjects. These images disappeared as soon as the eyes opened.

Distortions of time and space were common but only one subject reported any distortion of the body image.

On every occasion on which the drug was given a curious aphasia was observed. This, when combined with the flight of ideas which was frequently observed, led to complete incoherence of speech. In the middle of a sentence a subject would be unable to think of a word and, after hesitating, would move to another topic of conversation. He would then recall the missing word and proceed with the earlier topic. This led to a curious "back and forth" quality in speech which was likened by one observer to a gramophone needle repeatedly sticking in the groove of a record. This effect was sometimes heightened by a kind of confabulation in which some garrulous subjects, when blocking in speech occurred, repeated over and over words which came easily to mind.

Sixteen of the seventeen subjects taking part in the experiment said that on the whole the subjective effects of the drug were pleasant. Many expressed the opinion that they felt sure that they could easily become addicted to it. The subject who found the effects unpleasant was the Sinhalese already referred to who had a severe vaso-vagal attack. He was, incidentally, the only non-European involved in the experiment.

The effects of nalorphine on behaviour were so marked and of such a nature as to make the experiments on its ability to raise the threshold to ischaemic pain completely unreliable. A full analysis of these results is therefore not given. On the basis of these experiments, however, a subcutaneous dose of 6·7 mg. does not produce any more rise in threshold to ischaemic pain than 1·0 ml. of 0·5 N-saline.

DISCUSSION

Although these effects of nalorphine on human behaviour have already been described by other authors, it is felt that sufficient stress has not been laid upon these undesirable effects in the past. The suggestion that nalorphine may be a potent non-addicting analgesic makes it important to realize that profound disturbances of behaviour may occur when it is administered to patients who have not previously had large doses of major analgesics. Even a clinical trial of nalorphine as an analgesic is contraindicated in view of the results described in this paper.

The effects of nalorphine on behaviour are markedly similar in many respects to those of cannabis indica and are equally unpredictable. Although it has not been possible to establish a relation between the dose and the type of response elicited, a strong impression has been gained that the response is affected by the basic personality of the subject. Further investigation along these lines might be profitable.

The spontaneous recall of childhood memories prompted the suggestion that the effects of nalorphine might be similar to those of LSD. I therefore took 60 mg. of LSD25 by mouth to compare the subjective effects of these drugs and found them totally dissimilar. In general the subjective effects of nalorphine are pleasant, but this can certainly not be said of the effects of LSD25.

The waves of activity of nalorphine are difficult to explain. Similar effects have been noted with LSD25, and with cannabis indica, whilst Isaacs (1956) has observed that apomorphine causes waves of nausea and vomiting.

Finally, it is felt that these results cast some doubt upon the wisdom of the routine clinical use of mixtures of morphine and nalorphine, but do not contraindicate its use in acute poisoning by morphine or other major analgesics.

SUMMARY

1. The effects of nalorphine on the behaviour of healthy human volunteers who have not previously had a major analgesic are described.

2. Because of the effects on behaviour it has not been possible to confirm or deny the claim that nalorphine is a potent analgesic.

3. The effects of nalorphine on behaviour are felt to be so undesirable as to preclude its use as a major analgesic even if it is shown to be such a drug.

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TRANQUILLIZERS IN MENTAL DEFICIENCY: HYDROXYZINE

By

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THIS paper reports a double-blind type of clinical trial with hyperactive low-grade mental defectives. Chlorpromazine has previously been used with this group but a high incidence of toxic effects has been noted (McColl (1)). Reports on reserpine have been conflicting but a careful trial by Kirk and Bauer (2) reports the action of this drug if anything to be detrimental.

Several accounts have appeared of the successful use of hydroxyzine in diminishing psychomotor restlessness and agitation (Henne and Henne (3); Fouks, Laine Francois and Pagot (4); Farah (5)). All reports emphasized the rarity or absence of toxic results. It was therefore decided to evaluate this agent in a particular problem in mental deficiency practice.

SELECTION OF MATERIAL

Three modern bungalow type low-grade villas contained the most restless, aggressive and destructive patients in a hospital group of some 2,000 patients. From these villas the 23 most aggressive and destructive patients were chosen. These were responsible for a considerable proportion of the monthly repair bill. By age group the patients could be divided into 10 adults and 13 children. By intellectual testing 21 patients had a Terman-Merrill I.Q. of less than thirty points, two patients had I.Q. 32 and I.Q. 36 respectively. The vast majority were active, ambulant idiots. Eight patients had grand mal epilepsy.

ACCOUNT

The trial period was divided into three parts, a preliminary observation period of 17 days and two periods (29 days and 30 days respectively) when the patients received either hydroxyzine or a placebo. During the two latter periods the medical and nursing staff did not know which of these was being administered to the patients. The behaviour of the patients was recorded daily by nursing staff under three headings—(1) Activity, (2) Aggression, and (3) Social Behaviour to other patients—each of these qualities being divided up into thirteen different classes represented by a rating scale varying from -6 to $+6$. Normal behaviour corresponded to the zero of this scale. Since the purpose of a tranquillizer such as hydroxyzine is to reduce both positive and negative abnormalities, for analysis only the deviations of the scale from normal were used, that is, all measurements on the scale were treated as being positive. In this particular series of experiments no differences in the conclusions presented below would have been adduced had the observations been treated as being both positive and negative.

A further series of observations on night behaviour was obtained, but these contained so few abnormalities that there was little point in analysing them further.

General Average Deviations Derived from Analysis of Rating Scale

First villa patients:			
No. of observations	136	236	236
Activity	3·54	3·61	3·74
Aggression	2·06	2·12	2·36
Behaviour	3·78	3·90	3·94
Second villa patients:			
No. of observations	136	236	236
Activity	1·05	1·27	1·26
Aggression	0·49	0·53	0·62
Behaviour	2·08	2·15	1·97
Third villa patients:			
No. of observations	119	206	207
Activity	2·51	1·68	1·83
Aggression	1·51	0·50	0·61
Behaviour	2·25	1·25	1·12

ANALYSIS OF RESULTS

For two villas the statistical analysis of results showed that there was no significant difference between the average deviations for the three experimental periods under review. In the third villa there was a highly significant difference between the preliminary observation period and the period of administration of drug and placebo. However, there was found to be no difference in the results of drug and placebo and it was concluded that the nursing staff had been optimistic in their assessment of the effects of the two agents.

There was no significant difference between test and retest results on the Terman-Merrill scale.

There was no change in the recorded weights of the patients.

There were no toxic effects and no sedation noted among any of the patients on doses increasing to 500 mg. daily, at which level they were maintained for up to two weeks.

DISCUSSION

This trial was an attempt to give a clear answer to one circumscribed problem. It was evaluated entirely by objective methods which were subjected to detailed statistical analysis. The results showed that hydroxyzine appeared to have no significant effect upon psychomotor activity among hyperactive idiots and imbeciles under the circumstances outlined above.

Apart from sympathetic nursing staff the importance of environment was obvious throughout the trial. On fine days hyperactive patients dissipated their energies outdoors in the grounds whereas on wet days their enforced confinement was reflected in the mounting scores of the daily rating.

This paper does emphasize the need for controlled and blind trials, where the optimism of nursing staff can be taken into account. It is felt that further clinical trials are much needed in order to assess the place of tranquillizing drugs in mental deficiency practice.

SUMMARY

A double blind type of clinical trial with hydroxyzine is reported upon hyperactive low-grade mental defective patients. No significant difference appeared in a rating scale assessing activity, aggression and social behaviour. No toxic reactions occurred.

ACKNOWLEDGMENTS

My thanks are due to Dr. Prentice, Medical Superintendent, for help and encouragement, to Mr. Frank Downton, Lecturer in Mathematical Statistics, Exeter University for the statistical analysis, to the many members of the nursing staff who co-operated so fully at the Royal Western Counties Institution, and to Messrs. Pfizer Ltd., who kindly supplied the drug.

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ADDENDUM TO A HIERARCHY OF STRESSORS

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THE purpose of this short note is to reformulate the concept of a Hierarchy of Stressors (1) with respect to the Law of Initial Values developed by Wilder (2).

In 1955, Fischer and Agnew introduced in this Journal a concept (1) in which stressors ("alarming" stimuli) were classified according to their capacity to threaten the various levels of organization of the organism. This implied that different adaptive responses are elicited if the organism is threatened by stressors directed towards more basic urges and needs than those perceived as less vital to the organism's existence. In physiological terms: being-already-under-stress interferes with the neurohumoral mediation of another stressful situation (i.e. "alarming" stimuli) of similar importance and magnitude. It was proposed therefore to assume that the organism adapts to stressors in a hierarchically selective manner. In such a hierarchy, it was postulated, a "life stressor of primary importance" that is a remission provoking deep insulin coma, ranks higher than the "alarming" stimulus eliciting the schizophrenic process.

We believe that the concept of a Hierarchy of Stressors is another formulation of Wilder's Law of Initial Values, which refers to the relation of autonomic changes to pre-stimulation levels.

Working with a variety of pharmacological agents, Wilder (2) found in about 80 per cent. of his experiments with man that "the higher the initial value of a measured function, the lower is the tendency of the system to respond to furthering stimuli and the greater its tendency to decrease in responding to inhibitory stimuli; the highest as well as the lowest values tend to result in a reversal of action".

These significant observations have recently been verified on this continent by Lacey (3) who has shown for a variety of populations and stressors that the magnitude of stimulus-produced activation of the autonomic nervous system, in general, is related negatively to the pre-stimulus level of physiological function. Lacey argues that this is not simply an arithmetical artifact of there being but a limited range of response left available to an organism already functioning at high levels of autonomic excitation, but that it is a physiological consequence of, and deducible from, the facts of homeostatic restraint of response.

In our Hierarchy of Stressors concept, we suggested that "life stressors of primary importance" might be directly involved in the reversal of the schizophrenic process. In Wilder's formulation: the magnitude of increase of physiological changes decreases as the initial level increases; that is high initial levels of autonomic activity "quite often" result in a "paradoxical decrease" or reversal of action.

Our purpose was to show that Wilder's Law of Initial Values as well as the Hierarchy of Stressors concept are efforts to describe the very same phenomenon. This interpretation points to the necessity of quantifying both pre-stimulus levels as well as the subsequent physiological activation.

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USE OF MEPROBAMATE IN TENSION STATES

By

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IN RECENT YEARS a number of new drugs have appeared, grouped together as so-called tranquillizing agents. The publication of three very encouraging papers describing the use of meprobamate prompted the present trial. Selling (1955) prescribed one 400 mg. tablet daily after each meal and one at bedtime in 187 cases, combined with psychotherapy, and found its use in anxiety and tension states was of considerable value (90 per cent and 95 per cent respectively improved or recovered). Borrus (1955) used one to six 400 mg. tablets daily in 104 cases. In 68 per cent of all cases, and 78 per cent of the anxiety states, there were favourable results. Lemere (1955) contrasting chlorpromazine and reserpine, found meprobamate (used in over 250 patients with at least 70 per cent good results) to be relatively uniform in its action, remarkably free from side reaction and more effective in the relief of insomnia. All three authors stressed the absence of toxicity.

Meprobamate is related to mephenesin and other propanediol derivatives, chemically 2-methyl-2-n-propyl-1, 3-propanediol dicarbamate. Berger (1954), describing the pharmacology, reported its use as an interneuronal blocking agent and muscle relaxant without affecting respiration and other vital functions.

METHOD

The present study was made on 41 out-patients, in two separate groups. The first group consisted of 23 patients who received the active drug or a placebo, each made up in identical tablet form, in alternate courses at each visit to the clinic. The therapist remained ignorant of the preparation dispensed, since the key was known only by the chief pharmacist. The average duration of treatment was two months, but in equivocal cases continued over a longer period.

The second group consisted of 18 patients receiving only the active drug. A few were commenced on the active drug before placebo tablets were available, the remainder were cases of long duration who had not responded to previous pharmacological and psychotherapeutic treatment, and upon whom suggestion had had little effect in the past.

The selection of patients was restricted to those showing tension irrespective of diagnosis, and the great majority were suffering from either acute or chronic anxiety states, or depression associated with tension.

The dosage used was 400 mg. three or four times daily as suggested by Selling, apart from five cases where 800 mg. was later prescribed at each dose.

RESULTS

The results are summarized in the accompanying table. "Much improved" is limited to relief of tension, "moderately improved" indicates benefit of some degree with continuation of symptoms, "not improved" includes temporary or slight relief. Patients who felt equally improved on active drug and placebo, or improved while taking the placebo and not while taking the active drug, were excluded.

	Much Improved	Moderately Improved	Not Improved	Total
Group I				
Anxiety States	1	1	11	13
Depression associated with tension	1	—	7	8
Obsessive-Compulsive States	—	—	2	2
Group II				
Anxiety States	1	—	6	7
Depression associated with tension	1	2	5	8
Obsessive-Compulsive States	—	—	1	1
Impotence	—	—	2	2
	4	3	34	41

In Group I, two patients were much improved taking the active drug only. One case treated with E.C.T. for a depressive illness was improved, but retained a number of somatic symptoms. Receiving the drug she felt less irritable and more placid, then during a period on placebo felt worse again, but responded once more to the active drug by complaining of less tension and pain and stated she was sleeping better. The second improved case in this group did not respond to the placebo, complained of her head feeling peculiar the first two days on active drug and subsequently felt more relaxed. One moderately improved patient felt steadier on the active drug, felt worse taking the placebo, then receiving the active drug again remarked, "You feel as though you've taken a sedative."

The importance of controlled blind studies has been repeatedly stressed in a number of recent publications. This was borne out by observations in a number of patients. One chronically anxious patient felt "wonderful" the first week of four on placebo. A highly intelligent man, complaining of tension and excessive perspiration, felt calmer during a period later revealed as taking placebo. Another very intelligent patient, a woman suffering with longstanding obsessive-compulsive symptoms, felt improved, less anxious or unhappy during a placebo period. She remarked it was "certainly not faith" as she was very dubious of all new remedies.

In Group II, two patients were improved. A man suffering from headaches due to a mild depressive illness felt brighter and livelier. He left off taking tablets after three months and developed a recurrence of tightness across his head, which was again helped by treatment. The second patient, a chronically anxious woman who suffered with frequent bouts of diarrhoea, became less tense, although after a few weeks she relapsed for a period of three weeks, but then improved again. An interesting effect was produced when at a later date the dosage was increased to 800 mg. t.d.s. She felt calmer after the first dose but *stimulated* after the second dose. This occurred again after first leaving off treatment for a few days. There were two moderately improved cases, one depressed patient slept better although she did not benefit by day, and a second depressed patient felt some sedative effect.

TOXICITY AND SIDE-EFFECTS

As mentioned above, the three authors quoted stressed the absence of toxicity. More recent publications, however, have recorded a number of adverse reactions. Friedman and Marmelzat (1956) report a number of cases, the reactions including cutaneous, muscular, gastro-intestinal, and paradoxical cerebral effects. They described five cases in which purpuric rashes occurred, three cases of excitement instead of sedation, one case of diarrhoea, and one of extraocular palsy. Lemere (1956) thought the drug habit-forming in some cases, occasionally producing withdrawal symptoms (one patient taking large doses had a convulsion ten hours after discontinuation), and pointed out the need to watch for excessive self-medication in alcoholics. In spite of these drawbacks the author regarded meprobamate as a most useful drug for the relief of tension. Leiberman and Vaughan (1956) reported that many patients were disturbed by muscular weakness and lassitude. An annotation in the *British Medical Journal* (1956) drew attention to the incidence of toxic effects.

In the present series two patients complained of drowsiness (one for only the first few days of treatment), one patient complained that headaches from which she suffered were made worse, two cases of skin disturbance occurred (one patient developed erythema and urticaria lasting 24 hours twice within a few hours of taking one tablet, the second patient developed a rash and raised temperature on three occasions after taking two tablets, purpuric on one occasion, a widespread maculopapular eruption on two occasions), and two cases complained of tension (one case is described earlier above, the second case felt agitated, irritable, depressed and complained of headaches, lasting throughout eight days of treatment and stopping within 24 hours of stopping the drug). Effects on the muscular system, beneficial or otherwise, were not significant in the present series of cases, although stressed by other authors because of the relationship of meprobamate to myanesin.

Discussion

The result of this investigation did not confirm the claims made that meprobamate is a most effective drug for the treatment of tension. The selection of cases may account to some extent for the disappointing results, and the earlier less severely ill patients seen outside hospital practice may benefit more by treatment with this drug, but possibly not more than obtained using a barbiturate. West and da Fonseca (1956) report three trials, one straight trial and two "double blind" trials, comparing meprobamate with an inert tablet or amylobarbitone sodium. In the first trial the drug was most effective in the anxious group, but the results were not as favourable as those reported earlier. In the second trial there was a statistically significant superiority over the inert tablet, but in the third trial the results were comparable with amylobarbitone sodium, although some patients preferred one more than the other, suggesting that the drug differs in its action from amylobarbitone sodium and is not inactive.

The necessity of controlled trials is illustrated once again by the improvements noted with inert tablets even in patients of high intelligence.

That a few patients are benefited by the drug more than any other is suggested, but it is a question of trial and error in every case. No specific factors of sex, age or diagnostic category were elicited which could help in predicting suitable cases, other than the observation of the drug's greatest value in the symptomatic treatment of anxiety and tension in the American papers quoted.

The incidence of toxic effects has been more frequent and serious than first reported, following a pattern similar to almost every recently-introduced tranquillizing drug.

SUMMARY

Meprobamate proved less effective and less safe than previously reported in the series of 41 patients investigated. The possibility of skin eruptions and an increase in tension are two adverse reactions in particular which should be watched for. The occurrence of a rash after only one or two tablets in some cases makes this complication especially difficult to avoid.

I wish to thank Dr. Gerald Garmany for his encouragement in this trial, Mr. H. S. Grainger, chief pharmacist of Westminster Hospital, for his co-operation, Dr. G. R. Fryers for his suggestions and help in providing supplies of "Equanil" and control tablets made available by Messrs. John Wyeth and Brother Limited.

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Bibliography and Epitome

VOL. 56 **ACTA NEUR. PSYCHIAT. BELG.** DECEMBER, 1956

A Familial Intoxication with Lead. *Gousette, R., and Montanini, R.* .. 813
The Treatment of Fifty Chronic Schizophrenics with Large Doses of Reserpine. *Meurice, E.* .. 827
The EEG of Congo Natives and Racial Differences. *Verhaegen, P.* .. 842
A Psychiatric Centre of New York. *Bloch, C.* .. 853

VOL. 57 JANUARY, 1957

Magic Thought. *de Busscher, J.* .. 1
A Psychiatric Centre of New York. *Bloch, C.* .. 27
Meningiomas of the Lateral Recess. *de Busscher, J., et al.* .. 67

FEBRUARY

Myasthenia Gravis in a Girl of Three. *Szezepanska, H.* .. 91
First Therapeutic Results with Mytelase in Myasthenia. *Desmedt, J. E.* .. 94
Carotid Arteriography in Tumours of the Posterior Half of the Cerebral Hemisphere. *Soille, P.* .. 104
Mengioma of the Anterior Tubercle and of the Sella Turcica. *Hoffman, G. R., et al.* .. 116
Confabulation in Korsakoff's Syndrome of Traumatic Origin. *Flament, J.* .. 119

ACTA PSYCHIAT. NEUR. SCAND., SUPPT.

The Prognosis in Schizophrenia. *Langfeldt, G.* .. No. 110

VOL. 12 **AM. J. INDIVID. PSYCHOL.** 1956

Our International Congresses. *Rom, P.* .. 97
Psychosomatic Approach to Gynaecology and Obstetrics. *Bierer, I.* .. 99
Anthropology and Individual Psychology. *Mueller, A.* .. 106
The "Feminine Protest". *Ronge, P. H.* .. 112
Survey on Psychopedagogy. *Schaffer, H.* .. 116
Masochism in Terms of Adlerian Psychology. *Bressler, D. M.* .. 123
Generations and Layers of Society in Israel. *Blum, U.* .. 128
Sources of Obstacles in the Course of Therapy. *Lazarsfeld, S.* .. 136
The Application of Individual Psychology in a Criminal Case. *Sorge-Boehmke, E.* .. 139
The Application of Individual Psychology to Psychosomatic Medicine. *Lapisohn, L.* .. 143
Enlightening Children. *Bruck, M. A.* .. 157
A Study of Excessive Dependency in Mother-Son Relationships. *Rattner, L.* .. 171

VOL. 27 **AM. J. ORTHOPSYCHIAT.** JANUARY, 1957

Capacity and Motivation. *Levy, D. M.* .. 1
The Evaluation of Rehabilitation in the Individual. Panel, 1955. *Seidenfeld, M. A., et al.* 9
Methods for Community Mental Health Research. *Glidewell, J. C., et al.* .. 38
Problems in Evaluation of Mental Health Programs. *Lemkau, P. V., and Pasamanick, B.* 55
The Evolution of a Program of Individual Psychotherapy for Children with Aggressive Acting-Out Disorders in a New Residential Treatment Unit. *Gordon, G., and Siegel, L.* .. 59
The Role of the Administrator in Relation to Individual Psychotherapy in a Residential Treatment Setting. *Bloch, D. A., and Silber, E.* .. 69
The Influence of Unsolved Maternal Oral Conflicts upon Impulsive Acting Out in Young Children. *Rexford, E. N., and van Amerongen, S. T.* .. 75
Internalized Objects in Children. *Furer, M., et al.* .. 88
Psychiatric Aspects of Familial Dysautonomia. *Freedman, A. M., et al.* .. 96
A Pilot Study of Schizophrenic Children in a Nonresidential School. *Abbate, G. M., et al.* .. 107
Attitude Organization in Elementary School Classrooms. *Henry, J.* .. 117
Children's Intelligence Tests as a Measure of Dynamic Personality Functioning. *Fromm, E., et al.* .. 134
Group Experiences with Medical Students as a Method of Teaching Psychiatry. *Peltz, W. L., et al.* .. 145
Normal and Deviant Behavior in a Peasant Community: Montserrat, B.W.I. *Métraux, R., and Abel, T. M.* .. 167
Some Techniques for the Clinical Management of Masochism. *Durkin, H. E.* .. 185
Special Comment. Some Recent Trends in Psychoanalysis. *Berman, L., et al.* .. 202

VOL. 113 AM. J. PSYCHIAT. FEBRUARY, 1957

Evolution of Community Mental Health Concepts. *Felix, R. H.* 673

The New York State Community Mental Health Services Act: Its Birth and Early Development. *Hunt, R. C., and Forstenzer, H. M.* 680

The Operations of the New York State Community Mental Health Services Act in New York City. *Lemkau, P. V., et al.* 686

Psychophysiological Investigations in Cardiovascular Stress. *Silverman, A. J., et al.* 691

Rauwiloid Therapy in Alcoholism. *Thimann, J., et al.* 694

A Clinical Evaluation of Meprobamate Therapy in a Chronic Schizophrenic Population. *Tucker, K., and Wilensky, H.* 698

Seizures and the Menstrual Cycle. *Bandler, B., et al.* 704

The Psychophysiology of Schizophrenia. *Cowden, R. C.* 709

Epidemiological Studies of Chronic Frustration-Hostility-Aggression States. *Thorne, F. C.* 717

Psychiatric Night Treatment Unit in a General Hospital. *Moll, A. E.* 722

An Inpatient Psychiatric Service for Children in the Teaching Hospital. *Jensen, R. A., and Engstrom, D. P.* 728

Further Report on Experimental Evaluation of Mental Hygiene Techniques in School and Community. *Balser, B. H., et al.* 733

Some Hypotheses Concerning the Role of Sympathomimetic Amines in Psychiatric Conditions. *Garb, S., et al.* 740

MARCH

Neurosis and Social Class. I: Social Interaction. *Freedman, L. Z., and Hollingshead, A. B.* 769

Mental Health Implications of a General Behavior Theory. *Miller, J. G.* 776

Clinical Observations on the Use of Promethazine Hydrochloride in Psychiatric Disorders. *Erwin, H. J.* 783

Preventive Psychiatry—The Army's Mental Hygiene Consultation Service (MHCS) Program with Statistical Evaluation. *Allerton, W. S., and Peterson, D. B.* 788

The Well-Being Clinic: A Study of the Effectiveness of an Attempt to Provide Routine Mental Health Check-Ups for Community Groups. *MacLeod, A. W., et al.* 795

A Program for "Sexual Psychopaths" in a State Mental Hospital. *Lieberman, D., and Siegel, B. A.* 801

The Long-Term Comparative Results of Three Different Lobotomy Procedures. *Paul, N. L., et al.* 808

Multiple Therapy in Private Psychiatric Practice. *Alexander, L., and Moore, M.* 815

Failures in Psychiatry: The Chronic Hospital Patient. *Morgan, N. C., and Johnson, N. A.* 824

Urban Life and Mental Health. Socio-Economic Status and Mental Disorder in the Metropolis. *Rennie, T. A. C., et al.* 831

VOL. 114 ANN. MED-PSYCHOL. DECEMBER, 1956

The Different Fractions of Blood Proteins in a Group of Mentally Defective Children. *Chatagnon, C., et al.* 753

The Role of Psychic Factors in Infantile Convulsions and Epileptic Seizures During Infancy and Adolescence. *Sauguet, H., and Delaveleye, R.* 760

VOL. 115 JANUARY 1957

Observations of Lilliputian Hallucinations. *Wolff, E.* 1

Dynamics of the Alpha Rhythm in Psychopathology. *Daumézon, G., and Lairy, G.-C.* 35

The Results of Treatment of Paranoia and Paraphrenia with Largactil. *Bilikiewicz, et al.* 52

FEBRUARY

Research on the Motives and Circumstances of Falsehoods. *Durandin, G.* 209

Projective and Epilepto-sensory Mentality. *Helman, Z.* 243

Some Psychopathological Aspects of Experience and of our Knowledge of Mental Illness. *Crémieux, A., et al.* 259

Neuro-endocrine Influence on the Secretion of Milk. *Copelman, L.-S.* 297

MARCH

Chlorpromazine and Reserpine in Psychiatry. *Deshaies, G., et al.* 417

The EEG in Schizophrenic Syndromes. *Borenstein, P., and Dabbah, M.* 477

VOL. 11 AMER. J. PSYCHOTHER. JANUARY, 1957

The Clinic Team in Adult Treatment. *Sager, C. J.* 6

A Psychosomatic Concept. *Kaplan, H. I., and H. S.* 16

On the Mechanism of Hysterical Conversion. *Roth, N.* 39

A Definition of Treatment. *Collier, R. M.* 45

The Speaking Situation. *Barbara, D. A.* 56

The Problem of Homosexuality. II. *Berg, C.* 65

Homosexuality, Transvestism and Transsexualism. *Prince, C. V.* 80

The Problem of Sucking. *Fleischl, M. F.* 86

The Use of Dreams in Group Psychoanalysis: *Locke, N.* 98

VOL. 77 ARCH. NEUR. PSYCHIAT. JANUARY, 1957

Permanent Relief of Tic Douloureux by Gasserian Injection of Hot Water. *Jaeger, R.* 1
*Brain Copper-Protein Fractions in the Normal and in Wilson's Disease. *Porter, H., and Folch, J.* 8
Incidence of Neurological Complications in Congenital Heart Disease. *Tyler, H. R., and Clark, D. B.* 17
Long-Term Effects of Phensuximide (Milontin). *Rey-Bellet, J., and Lennox, W. G.* .. 23
*Motivational Determinants in Modification of Behavior by Morphine and Pentobarbital. *Hill, H. E., et al.* 28
Pathogenesis of Trigeminal Neuralgia. *List, C. F., and Williams, J. R.* 36
Jean-Martin Charcot (1825–1893). *Tomlinson, J. C., and Haymaker, W.* 44
Television Therapy. *Tucker, H., et al.* 57
Lead Poisoning in Children. *Jenkins, C. D., and Mellins, R. B.* 70
Psychic Function of Temporal Lobe as Inferred from Seizure Phenomena. *Ostow, M.* 79
*Some Observations on the Use of Tranquillizing Drugs. *Szasz, T. S.* 86
The Trouble with Psychiatric Research. *Ruesch, J.* 93
*Frontal Lobe Damage and Flicker Fusion Frequency. *Medina, R. F.* 108

Brain Copper-Protein Fractions in the Normal and in Wilson's Disease

Brain proteins in hepatolenticular degeneration, like those in normal brain, can be separated into three copper-containing fractions: Fraction I, extracted with 0·1 M acetate buffer pH 4·5 (or with water or with 0·1 M bicarbonate buffer pH 8·2); Fraction II, extracted at pH 3·5 and vanishing ionic strength, and the residual Fraction III.

The greatest absolute amount of pathological brain copper in hepatolenticular degeneration is extracted in Fraction I. Of this Fraction I copper, slightly more than one-half is nondialyzable at pH 4·5 and may or may not be identical with the Fraction I copper of normal brain.

A significant portion of the pathological copper in the brain in hepatolenticular degeneration is present in a form not found in appreciable amounts in normal brain. This abnormal copper-protein combination is similar to normal Fraction I in being soluble both in 0·1 M acetate buffer pH 4·5 and in 0·1 M bicarbonate buffer pH 8·2, but is different from normal Fraction I copper-protein(s) in its failure to retain copper on dialysis at pH 4·5.

The finding that bicarbonate buffer extracts of the fresh tissue do not lose copper on dialysis against bicarbonate buffer indicates that substantially all of the copper in the brain in hepatolenticular degeneration is bound in undialyzable form, presumably to proteins.

(Authors' Abstr.)

Motivational Determinants in Modification of Behavior by Morphine and Pentobarbital

Since the description of drugs as either "stimulant" or "depressant" did not appear to be sufficient to account for their behavioral effects, it was proposed that motivational factors must be considered as partial determinants of such effects. The present experiment, designed to test this hypothesis, was carried out on 182 former narcotic addicts. Visual-manual reaction times were measured on separate groups of subjects after the administration of 15 mg. of morphine sulfate or 250 mg. of pentobarbital sodium, and these were compared with the reaction times of other subjects who received no drug on the test day. Each of these measurements was made under four conditions which differed from each other with respect to the incentive (morphine reward) offered for participation in the experiments.

The results indicate that changing incentives significantly modifies control reaction time, as well as the effects of morphine or pentobarbital thereon. Thus, in comparison with the control, both drugs acted either as "stimulants" (accelerated reaction time) or as "depressants" (slowed reaction time) or had no effect, depending on the particular incentive conditions under which they were administered. The actions of these drugs, however, were "specific" with respect to each other: The effect of pentobarbital changed from "depressant" to "stimulant" when conditions changed from "Low Incentive" to "High Incentive", while the action of morphine changed from "stimulant" to "depressant" when identical changes in incentive level were made. Viewed from another standpoint, the results indicate that sensitivity to changes in incentives is reduced by morphine and enhanced by pentobarbital.

It is postulated that changes in incentive levels, manipulated by the observer, alter performance through effects on specific motivations. Hence, from the data presented, it is inferred that performance, as well as the effects of drugs thereon, is determined in part by the particular motivations that obtain when the measurements are made. The "specificity" of the effects of any particular drug will therefore be apparent only if the motivations involved in the behavior studied are controlled.

Furthermore, it is concluded that drugs exert "specific" effects on particular motivations, and that differences in the attractiveness of drugs for different persons may be partly explained on the basis that motivations acceptable to the subject can be enhanced and unacceptable ones suppressed by use of particular chemical agents.

(Authors' Abstr.)

Some Observations on the Use of Tranquillizing Drugs

The purpose of this essay is to inquire into, and call attention to, some sociopsychological aspects of the current vogue of using tranquilizing drugs in psychiatric disorders.

The use of these drugs rests on the premise that psychiatry deals with "mental illness" and that such illness presents a problem essentially analogous to that encountered in medicine (and particularly in infectious disease). There is evidence to suggest that this "medical" model of behavioral disturbance is inadequate and misleading. If such disturbances do not constitute "diseases" which manifest themselves in certain "signs" and "symptoms", then measures based on this concept are likely to be faulty, and probably harmful to patient, physician, or society.

A brief analysis of this problem is organized around the following three questions: (1) What do we, as physicians and psychiatrists, do when we prescribe tranquillizing drugs? (2) Whom do we treat? (3) Is this form of treatment justifiable? The generally accepted answers to each of these questions are summarized. They are followed by suggestions for additional possible "answers", the most important of which are (1) that the use of these drugs may represent a new "symptom" of the ancient occupational disease of physicians known as "furor therapeuticus"; (2) that we treat ourselves and the patient's social environment; and (3) that whether we hold the treatment to be justifiable or not will depend on what position we take *vis-à-vis* the patient's conflict with other persons and society.

In conclusion, the role and significance of defiance of authority and of deviance from social norms in "mental illness" (and in all modes of human life, for that matter) are briefly mentioned. These considerations are emphasized in an effort to substantiate the legitimacy, and possible value, of taking a position of caution and criticism with respect to the widespread use of tranquillizing drugs in medical and psychiatric practice.

(Author's Abstr.)

Frontal Lobe Damage and Flicker Fusion Frequency

Matched groups of patients who had sustained bilateral prefrontal lobotomy, hospitalized control patients (non-surgical), and normal control subjects were tested for flicker fusion frequency. Surgery for the operatee group had been performed from eight to nine years prior to testing. Pertinent control criteria were race, age, sex, period to time institutionalized, amount of schooling, and pre-operative diagnosis. The findings of the study are as follows:

1. The frontal lobe damage sustained in prefrontal lobotomy is not reflected in a permanently depressed fusion point.
2. There is no indication that lobotomized subjects are objectively more accurate (less variable) in locating their fusion point than are hospitalized control or normal control subjects.
3. A definite linear decrease in fusion frequency level with age is found in patient and in normal subjects.
4. The most pronounced drop in fusion level with age occurs between 45 and 55 years of age.
5. The extent to which a subject varies or deviates from his own fusion point in successive trials does not appear to be dependent on age. There is nothing to indicate that older persons are less variable than young persons.

(Author's Abstr.)

FEBRUARY

Studies in Headache. *Ostfeld, A. M., et al.*	113
Face-Hand Test Responses of Psychotic and Mentally Defective Patients. *White, R. P.*	120
*Mental Function and Cerebral Oxygen Consumption in Organic Dementia. *Lassen, N. A., et al.*	126
*Flicker Fusion Thresholds in Multiple Sclerosis. *Parsons, O. A., and Miller, P. N.*	134
Trimethadione: Its Dosage and Toxicity. *Wells, C. E.*	140
Itch Sensation and Recovery of Sensation in Spinal Cord Injuries. *Arieff, A. J., et al.*	156
Anxiety as an Aid in the Prognostication of Impending Death. *Beigler, J. S.*	171
*Common Medical Disorders Rarely Found in Psychotic Patients. *Ehrentheil, O. F.*	178
Brunswik's Theory of Perception. *Imboden, J. B.*	187
*Studies in the Effects of Lysergic Acid Diethylamide (LSD-25). *Liebert, R. S., et al.*	193
Psychopharmacotherapeutic Research. *Rashkis, H. A., and Smarr, I. R.*	202
Perception: Equivalence, Avoidance, and Intrusion in Schizophrenia. *Scher, J. M.*	210
U.S. Army Psychiatric Training Program. *Forrer, G. R., and Grisell, J. L.*	218
*Diagnostic Testing for Cortical Brain Impairment. *Garrett, E. S., et al.*	223

Mental Function and Cerebral Oxygen Consumption in Organic Dementia

Clinical, neurophysiological, and psychological data were obtained and evaluated individually for 19 subjects. Clinically, 6 were normal; 3 had questionable dementia; and 10, indisputable dementia.

The cerebral metabolic rate of oxygen ($CMRO_2$) was measured in cubic centimeters of 0_2 per 100 gm. of brain per minute by the Kr^{85} method, using bilateral sampling of internal jugular venous blood. The clinically normal group had a $CMRO_2$ of 3·6–3·2; the intermediate group, a $CMRO_2$ of 3·2–3·0 and the demented group, a $CMRO_2$ of 2·8–1·6.

Arguments are advanced that abnormally low CMRO$_2$ (3·0 or below) in patients without acute cerebral affections indicates cortical atrophy—a conclusion confirmed by air encephalography for the five subjects so examined.

The psychological grouping of the patients was based on the presence or absence of fluctuations during learning and on two criteria derived from a block-pattern test. The four groups thus obtained comprised one without abnormalities, and three of increasing mental dysfunction. These groups correlated well with the CMRO$_2$ values in all cases.

Observations for the six patients with CMRO$_2$ values of 3·0 to 2·6 suggest that the psychological method described offers possibilities for the diagnosis of slight organic dementia.

(Authors' Abstr.)

Flicker Fusion Thresholds in Multiple Sclerosis

The central visual flicker-fusion thresholds of 20 male veteran patients with multiple sclerosis and 20 control subjects with no central nervous system disorder, are compared. A markedly impaired flicker discrimination is found in the M.S. group. Only three M.S. patients had evidence of scotomata; however, nine possessed some degree of optic pallor. The pallor group manifests the greatest impairment of flicker discrimination, but the non-pallor M.S. group shows also significantly lower values than the controls. It is suggested that these results are due mainly to optic neuropathy accompanying retrobulbar neuritis. These effects apparently are not revealed by standard visual field examinations but do appear when flicker-fusion thresholds are determined.

(Authors' Abstr.)

Common Medical Disorders Rarely Found in Psychotic Patients

Hay fever, asthmatic attacks, and the acute stages of rheumatoid arthritis are extremely rare among psychotic patients.

Duodenal ulcer is not rare in psychotics and is probably just as frequent as in the general population.

An attempt is made to apply existing physiological and psychological hypotheses in the explanation of these facts.

(Author's Abstr.)

Studies in the Effects of Lysergic Acid Diethylamide (*LSD*-25)

This study is concerned with the effect on spatial localization of lysergic acid diethylamide (LSD), assumed to be a primitivizing drug. Normals and schizophrenics, with and without LSD, adjusted a luminescent rod in a darkroom to apparent verticality under various conditions of body tilt and different initial setting of the rod (starting position).

With LSD, for normals and schizophrenics, the apparent vertical is displaced in the direction opposite to the side of body tilt. Under LSD this displacement is significantly increased for normals; for schizophrenics there is no evidence that the drug significantly alters the effect of body tilt on perception of verticality.

Without LSD, for schizophrenics and normals, the effect of starting position is that of displacement of the apparent vertical from the plumb line in a direction toward the position in which the rod is placed at the beginning of the trial. For normals as well as for schizophrenics LSD increases the starting position effect; this increase is not significant in normals but highly significant in schizophrenics.

The differential effects of LSD are evaluated with reference to the assumption that LSD operates as a primitivizing agent.

Additional comparisons between normals and schizophrenics with respect to the effect of body tilt and starting position on apparent verticality without LSD are included.

(Authors' Abstr.)

Diagnostic Testing for Cortical Brain Impairment

By using both the Spiral After-effect Test and the Graham Kendall Test, the diagnosis of cortical brain impairment is greatly facilitated. Cases missed by one are detected by the other test. The two supplement each other and together make a highly valid battery for determination of cortical involvement.

(Authors' Abstr.)

MARCH

*The "March" of Temporal Lobe Epilepsy. *Stevens, J. R.* 227
*Asynchronism of Electrical Activity of Frontal Lobes During Sleep. *Adams, C. L., et al.* 237
*Chlorpromazine (Thorazine) Treatment of Disturbed Epileptic Patients. *Bonafede, V. I.* 243
*The Pattern of Conduction of Amygdaloid Seizure Discharge. *Gloor, P.* 247
*Sites of Origin of Hypoglycemic Seizures in the Rabbit. *Tokizane, T., and Sawyer, C. H.* 259
Antidiuretic Effect of Lysergic Acid Diethylamide in Humans. *Kies, M. W., et al.* 267
Why Patients Leave Psychotherapy. *Frank, J. D., et al.* 283
Verbal Behavior Analysis. *Gottschalk, L. A., et al.* 300

Adjustment Patterns of Leadership and Defenses in a Disturbed Child Group. *Goldstein, I. M., et al.* 312
*Comparison of Psychological Effects of Certain Centrally Acting Drugs in Man. *Kornetsky, C., et al.* 318
*Relationship Between Effects of a Number of Centrally Acting Drugs and Personality. *Kornetsky, C., and Humphries, O.* 325
*Effects of Centrally Acting Drugs on Two Tests of Brain Damage. *Primac, D. W., et al.* 328
Imprinting and the Establishment of Gender Role. *Money, J., et al.* 333

The "March" of Temporal Lobe Epilepsy

The convulsive attacks of 40 patients with psychosensory or psychomotor epilepsy have been subjected to sequential content analysis. Certain patterns of seizure organization appear from such analysis, suggesting an ordered "march" of seizure manifestations in convulsive attacks originating in the temporal lobes and environs.

The varied subjective manifestations of individual attacks indicate strong relationship of epigastric sensation, subjective fear, and motor behavior of the flight-fight pattern. On the contrary, the small group of patients with cephalic aura experience relatively pleasant anticipatory states, free of fear components. Vertigo and tinnitus are followed by illusory states in three-fourths of the patients studied, and fear was present in only one of the seven patients in this group. The disagreeable odor characteristic of the "uncinate fit" never appeared as a first symptom of attack in the eight patients reporting this sensation, and most commonly succeeded the subjective state of fear. Olfactory aura of pleasant nature, much rarer, was always a first symptom of an attack, and was not followed by fear-flight-fight manifestations but always was succeeded by a sense of intense mental confusion.

Preliminary analysis of the content and sequence of this group of psychosensory and psychomotor attacks appears to offer a doorway into greater understanding of the organization of emotional feeling and expression.

(Author's Abstr.)

Asynchronism of Electrical Activity of Frontal Lobes During Sleep

Electroencephalographic studies on 202 patients with frontal lobotomy indicate that the only consistent electroencephalographic finding resulting from this operation is an asynchronism of slow activity in the frontal areas during deep sleep. This abnormality never appears before the 18th post-operative month. It becomes increasingly common and evident thereafter and is found in all cases 36 months or more after operation. This change is permanent and irreversible. The abnormality is restricted to the frontal lobes, and only the slow activity of deep sleep in the frontal lobes is affected. Sleep spindles and all other patterns in the frontal areas and elsewhere remain normal; in other areas the slow activity of deep sleep is undisturbed.

It is assumed that this late-appearing asynchronism of slow activity in the frontal areas during deep sleep results from a delayed degeneration of commissural fibers which link certain nuclei in the left and right thalamus.

(Authors' Abstr.)

Chlorpromazine (Thorazine) Treatment of Disturbed Epileptic Patients

The majority of emotionally disturbed epileptics show an excellent response to chlorpromazine.

Anticonvulsant medication must never be reduced while the patient is on chlorpromazine therapy.

Potentiation or intensification of barbiturate effect is apparently of little or no clinical significance.

Anticonvulsant drugs should be increased or supplemented at the earliest indication of any seizure increase during chlorpromazine therapy.

Chlorpromazine is well tolerated, without any marked alteration in the seizure frequency in most epileptics.

Maintenance dosage is established by trial and error and may be necessary for prolonged periods.

(Author's Abstr.)

The Pattern of Conduction of Amygdaloid Seizure Discharge

The conduction of electrical after-discharge induced by electrical stimulation of the amygdaloid nucleus was studied in 19 cats in order to understand the functional anatomy of seizure mechanisms in ictal temporal lobe automatism in man known to be dependent upon epileptic discharge originating in the amygdaloid region. The findings are as follows:

1. The subcortical structures fired by amygdaloid after-discharges extend from the septal area back to the mesencephalon, with inclusion of the whole diencephalon, hypothalamus, and thalamus as well.
2. There is a rather sharp contrast between the diffuse and extensive subcortical conduction of amygdaloid seizure discharge and the restricted conduction to cortical regions.

3. The cortical areas fired by amygdaloid after-discharges comprise the hippocampus and those cortical areas of the cat's brain that are homologous to man's anterior temporal and insular cortex. These findings in the cat are in agreement with the topographical distribution of epileptic discharges in patients with ictal automatism due to discharge in the amygdaloid region.

4. Amygdaloid after-discharges are preferentially conducted to subcortical structures. Among these subcortical structures, the most constant firing occurs in the basal diencephalic and mesencephalic tegmental areas, the same regions which, on the basis of previous experiments, are known to represent the direct subcortical projection fields of the amygdala.

The mechanism of propagation of amygdaloid after-discharges to the thalamus may be related to the marked build-up of an excitatory state occurring in response to repetitive amygdaloid firing, which in cases of intense amygdaloid discharge, as in seizure activity, may supposedly become vigorous enough to allow propagation of discharge from the basal diencephalon and the brain stem into the thalamic gray matter.

The conduction to the ipsilateral "temporoinsular" cortex is more labile than that to the thalamus, and even more labile seems to be that to the contralateral amygdala and the contralateral temporoinsular cortex.

The preferential conduction of amygdaloid after-discharge into highly integrative formations of the subcortex tends to corroborate Penfield's hypothesis that the phenomena of ictal epileptic automatism may be explained on the basis that seizure discharge originating in the amygdala actively fires into the "centrencephalic system".

The frequent electrographic suppressor onset of temporal lobe seizures originating in the amygdaloid region was re-duplicated in some of these animal experiments. Its possible relationship with the generalized cortical low-voltage activity, as often produced by amygdaloid stimulation, is discussed.

(Author's Abstr.)

Sites of Origin of Hypoglycemic Seizures in the Rabbit

An electroencephalographic study has been made of the characteristics, sites of origin, and projection of hypoglycemic seizures in the restrained, non-curarized rabbit. Records were made of the electrical activity of the cerebral cortex and subcortical centers approached by stereotaxic means. The results reveal that insulin-induced hypoglycemic seizures arise in and may be confined to the amygdala and/or the hippocampus. Severer seizures may project to the pre-optic, hypothalamic, and other brain stem regions without reaching the frontal or limbic cortical area. The localized seizures are not accompanied by any apparent somatic motor activity and are detected only by the deep electrodes. Increased secretion of adrenaline following surgery and stereotaxic restraint may counteract the effect of quite massive doses of insulin to the extent that the blood-sugar level is not lowered to the seizure range. The adrenal effect may be counteracted by cutting the splanchnic nerves. It is suggested that the beneficial results of insulin therapy may be related to undetected subcortical seizures.

(Authors' Abstr.)

Comparison of Psychological Effects of Certain Centrally Acting Drugs in Man

Ten normal volunteers were given various doses of lysergic acid diethylamide (LSD), meperidine, secobarbital, and chlorpromazine. The order of drug administration was a 10 × 10 Latin square, which included two placebos.

All drugs were administered orally, and the "double-blind" technique was employed throughout. Seventy-five minutes after ingesting the drug, subjects were given a variety of psychological tests, which included intellectual, motor, and perceptual tasks.

The following conclusions were drawn from the data:

The effect of drugs on psychological performance in man are due not only to the specific pharmacological activity of the drug, but also to the specific reactivity of the subject and to an interaction of the two.

There is not a significant correlation between the objective and the subjective psychological effects of a given drug. However, the drugs that produce the greater mean objective effect also produce the greater mean subjective effect.

Two hundred milligrams of secobarbital sodium; 100, 200, and 400 mg. of chlorpromazine hydrochloride, and 50 γ and 100 γ of lysergic acid diethylamide significantly impair performance on a variety of psychological tests. Meperidine hydrochloride in 50 and 100 mg. doses does not impair performance on the same psychological tests.

LSD had significant effects on intellectual and perceptual tasks but did not cause significant impairment of motor tasks, whereas chlorpromazine and secobarbital affected motor tasks but in general did not cause statistically significant impairment of performance on simple intellectual and perceptual tasks.

Two hundred milligrams of chlorpromazine does not impair performance significantly less than does 200 mg. of secobarbital sodium.

(Authors' Abstr.)

Relationship Between Effects of a Number of Centrally Acting Drugs and Personality

Ten normal young adults were given various doses of chlorpromazine, meperidine, secobarbital, and lysergic acid diethylamide (LSD). The effects of the drugs were determined by both objective and subjective psychological tests. The Minnesota Multiphasic Personality Inventory was also administered to all the subjects prior to the start of the experiment. Four scales from this test were selected for testing relationships between personality variables and both the objective and the subjective effects of the drugs.

The Depression and Psychoasthenia scales correlated significantly, or almost significantly, with the subjective effects and, to a less extent, with the objective effects of those drugs and dosages that produced significant effects.

These results support a hypothesis that personality plays a role in determining the extent of drug effect.

(Authors' Abstr.)

Effects of Centrally Acting Drugs on Two Tests of Brain Damage

Ten subjects, with a mean age of 20·5 and a mean verbal I.Q. of 110·3, were given low and high doses of one of four drugs or a placebo. Chlorpromazine, LSD-25, meperidine, and secobarbital were administered according to a Latin-square experimental design. The subjects were tested approximately three and a half hours after drug administration on two procedures used for assessing brain damage: the Continuous Performance Test (C.P.T.) and the Wisconsin Card Sorting Test.

None of the measures of performance on the Wisconsin Card Sorting Test show any apparent effect of the drugs. Performance on the C.P.T., however, is significantly poorer under chlorpromazine and becomes even worse as the dose is increased. Although no other drug had a significant effect on C.P.T. performance, it is doubtful if the peak effects of meperidine and secobarbital were measured.

(Authors' Abstr.)

VOL. 17 **ARCH. PSICOL. NEUR. PSICHIAT.** 1956

SYMPOSIUM ON RESERPINE AND CHLORPROMAZINE

Hellebore and Reserpine. *Belloni, L.*	115
The Anatomo-physiological Basis of Modern Pharmacological Treatment in Psychiatry. *Gozzano, M.*	149
Somatic Effects of Reserpine. *Magrassi, F., and Scalfi, L.*	163
Discussion	217
Reserpine Treatment in Psychiatry. *Benedetti, G.*	295
Results and Considerations on the Effect of Reserpine in the Treatment of Psychoses. I. *Fazio, C.*	313
Results and Considerations on the Effect of Reserpine in the Treatment of Psychoses. II. *Giberti, F.*	316
Reserpine in Catatonic Schizophrenia. *Barison, F., and Massignan, L.*	347
Reserpine Therapy in Chronic Schizophrenia. *Cargnello, D.*	359
The Use of Reserpine in States of Psychic Excitement. *Gararaglia, G., and Negri, V. V.*	376
Modifications in the Reserpine Treatment of Chronic Schizophrenia. *Santangelo, G.*	388
Discussion	394
Effects of Reserpine and of Reserpine Associated with Psychotomies in Some Senile Psychoses. *Negri, F.*	441
Discussion	452
Reserpine in Child Psychiatry. *Sacerdoti, G., and Vegro, G.*	459
Discussion	478
The Action of Chlorpromazine and of Reserpine on the Extrapyramidal Nervous System. *Balestrieri, A.*	483
Discussion	513
The Action of Chlorpromazine and of Reserpine on Some Symptomatic Manifestations of Psychoneurosis. *Gomirato, G.*	531
Discussion	544
Modification of the EEG by Reserpine Treatment. *Colombati, S.*	569
Discussion	581
Treatment with Reserpine of Some Toxic Excitements. *Benassi, P., and Fava, D.*	601
Chlorpromazine and Reserpine in Psychiatry. *Visintini, F.*	611
Discussion	622
The Combined Action of Reserpine and Chlorpromazine in Psychiatric Practice. *Reda, G. C., and Germano, V.*	647
Discussion	654
Combined Treatment with Reserpine and Other Psychiatric Measures. *Macchi, G.*	661
Discussion	671
Reserpine and Psychotherapy. *Bazzi, T.*	675
Discussion	682
The Profession of Psychology in the Modern World. *Gemelli, A.*	693
A Group Reaction for the Diagnosis of Asocial Tendencies. *Zavalloni, R.*	713
The Drawing Behaviour of the Child in the First Representation of Indistinct Disposition. *Zecca, G.*	737
A Contribution to the Study of Mental Fatigue in Middle School. *Roser, O. L., and Nicoletti, I.*	755

The Method of Discriminating Function Applied to the Diagnosis of Mental Deterioration. *Alberoni, F.* 769
The Phenomenon of Interference in Shock and its Significance in the Rorschach Test. *Basaglia, F., and Dalla Barba, G.* 783
Psychic Determinism and Freedom in the Development of the Personality. *Mailloux, N.* 853
The Unity of the Image. *Ponzo, M.* 867
Anxiety Neurosis and Cachectic States of Secondary Anorexia after Adenotonsillectomy. *Dalla Volta, A., et al.* 877
Phenomenology of Tridimensional Visual Perception in Relation to the "Transactional Theory". *Massucco, Costa A.* 905
Psychopathological Considerations of Oneirism. *Barison, F., and Massiquan, L.* .. 933
Mental Weakness. *Pasqui, E.* 951
Analysis of the Process of Improvement and of Cure during Psychotherapy. *Benedetti, G.* 971
Acceptance of Alcoholic Drinks in a Group of Mentally Defective Children of Various Grades. *Zucchi, M., and Santangelo, F.* 1009
Phenomenology of Tridimensional Visual Perception in Relation to the "Transactional Theory". *Massucco Costa, A.* 1023
A Critical Study of the Hypothesis of the Affinity of Instincts and Sympathetic Facial Expression. *Terstenjak, A.* 1063
Observations and Criticism of the Concept of Schizasthenia. *Gastaldi, G.* 1093
The Structure of Confusional Symptomatology. *Gomirato, G.* 1119

VOL. 18 1957
A Study of the Maze Test of Porteus in Normal Subjects and Mental Patients. *Alliani, E., and Riccio, D.* 3
The Refusal of the V Picture of the Rorschach Test. *Basaglia, F., and Dalla Barba, G.* 17
Perseveration in the Infantile Rorschach. *Zecca, G.* 27
Doctrinal and Practical Aspects of Psychosomatic Medicine. *Rigotti, S.* 39
Experiences of "Personalisation of the Eye" in Schizophrenia. *Callieri, B.* 65

VOL. 80 **BRAIN** MARCH, 1957
Hemichorea (Hemiballismus) Without Lesions in the Corpus Luysii. *Martin, J. P.* .. 1
Developmental Abnormalities in the Region of the Foramen Magnum. *Spillane, J. D., et al.* 11
*Vascular Mechanisms of Birth Injury. *Norman, R. M., et al.* 49
Behçet's Syndrome with Neurological Complications. *Wadia, N., and Williams, E.* .. 59
*Vivid Day-dreaming: An Unusual Form of Confusion Following Anterior Cingulectomy. *Whitty, C. W. M., and Lewin, W.* 72
*The Effects of Some Drugs on the Electrical Activity of the Brain. *Bradley, P. B., and Elkes, J.* 77
On the Nature of Pain. *Gooddy, W.* 118

Vascular Mechanisms of Birth Injury

A description has been given of the clinical and pathological features of two cases of mental deficiency apparently caused by injury at birth. Both brains showed areas of cortical atrophy in the cerebrum and cerebellum occupying either the boundary zone between two main arterial territories or lying within the fields of supply of individual arteries. These cases illustrate the complex interplay of the vascular mechanisms operative in cerebral birth injury. The boundary zone lesions were considered to be due to a fall below critical level in the systemic blood pressure such as might have occurred in shock associated with birth injury. The second type of lesion was believed to have followed compression of arteries at certain preferential sites caused by the displacement of the brain substance during the process of birth. Such compression would be facilitated by a coincidental lowering of blood pressure and it is significant that in these brains, lesions of both types of distribution occurred together. In the second case, paraventricular softenings of the central white matter and pathological changes in the basal ganglia formed a pattern of cerebral damage attributable to obstruction of the great vein of Galen. In addition, the medial thalamic nucleus contained dense perivascular rings of myelinated fibres which differed from the appearances hitherto reported in *état marbré.*

(Authors' Abstr.)

Vivid Day-dreaming: An Unusual Form of Confusion Following Anterior Cingulectomy

A transient limited confusional state is described as occurring in 8 out of 10 patients after cingulectomy.

The condition consists essentially of an increased vividness of thoughts, dreams and phantasies, so that there is difficulty in distinguishing between mental events and happenings in the external world.

The possible neurological mechanisms involved are briefly discussed.

(Authors' Abstr.)

The Effects of Some Drugs on the Electrical Activity of the Brain

1. The effect of various drugs on the electrical activity of the brain has been studied (*a*) in the conscious animal carrying permanently implanted electrodes, (*b*) in acute preparations sectioned at high spinal or mid-brain level (*encéphale and cerveau isolé* respectively), (*c*) in the barbitone anaesthetized preparation.

2. The importance of studying the effects of drugs in conscious chronic preparations (in which changes in electrical activity can be observed simultaneously with behaviour) is emphasized.

3. In the conscious animal, atropine and physostigmine caused a dissociation between electrical activity and behaviour. Atropine induced slow wave activity. This was similar to that seen in sleep; sleep, however, was never observed. Physostigmine led to an electrical pattern similar to that seen in the alert state, without a corresponding alerting of behaviour. The two drugs were mutually antagonistic.

4. l-Hyoscyamine produced effects similar to those of atropine. d-Hyoscyamine and neostigmine were ineffective, except when the latter drug was given in high enough doses to induce peripheral symptoms.

5. Amphetamine and LSD-25 in the conscious animal led to an alerting of the EEG, and behavioural excitement, there being, in the case of these two drugs, close correlation between electrical activity and behaviour. The effects of amphetamine were independent of the environment, and depended on dosage only. The effects of LSD-25 depended on factors in the environment, as well as upon the drug itself.

6. In the acute preparations the effects of atropine were similar to those seen in the conscious animal, and were still present when either the upper spinal cord, or mid-brain were transected. Amphetamine caused alerting both of behaviour and electrical activity in the *encéphale isolé*, but had no effect on the *cerveau isolé*. LSD-25 had no effect on either of these preparations in the cat, but had some effect on the *encephale isolé* preparation in the monkey.

7. Atropine, physostigmine and LSD-25 modified the electrocortical patterns seen under barbitone anaesthesia. Amphetamine had no effect on barbitone induced activity. The depth of anaesthesia remained apparently unaffected by these drugs.

8. None of the effects described could be correlated either with changes in respiration, or changes in systemic blood pressure.

9. The groupings of the drugs in relation to their effects on electrical activity and on behaviour in the conscious animal, and the levels of section in acute experiment, is discussed. An attempt has been made to relate the findings to the known distribution of the reticular activating system, and the physiology of the brain-stem. It is suggested that three types of receptors are present in the brain. The receptors for LSD-25 may be specially related to the medial collaterals of the great afferent pathways.

10. The possible operation of chemical fields within selected areas of the brain is discussed.

(Authors' Abstr.)

VOL. 7 **BRIT. J. DELINQ.** JANUARY, 1957

The Juvenile Court and the Child. *Younghusband, E.* 181
Justice and Welfare in Juvenile Courts. *Cavenagh, W. E.* 196
The Administration of the Juvenile Penal Law in the Federal Republic of Germany. *Sieverts, R.* 206
Plans to Reform the Swiss Juvenile Penal Law. *Frey, E. R.* 228
The Work of the Children's Department in Relation to the Juvenile Court. *Collis, A.* 242

APRIL

Child Guidance Clinics and the Prevention of Juvenile Delinquency. *Barbour, R. F.* 271
Role Theory and the Treatment of the Antisocial Acting-Out Disorders. *Parker, S.* 285
The Use of Correctional Institutions as Self-Study Communities in Social Research. *Grant, J. D.* 301
Commentary. *Jones, M. S.* 307
Research and Methodology: Current Research 309

VOL. 30 **BRIT. J. MED. PSYCHOL.** MARCH, 1957

The Other Man's Point of View. *Rodger, T. F.* 3
The State of the Ego in Chronic Schizophrenia. *Freeman, T., et al.* 9
Screening . . . for What? The Relevant Use of Psychological Tests in Medical Education. *Harrower, M.* 19
Discipline in the Home and Intellectual Development. *Kent, N., and Davis, D. R.* .. 27
Patterns of Anxiety: the Phobias. *Dixon, J. J., et al.* 34
A Note on Leshan and Worthington's "Personality as a Factor in the Pathogenesis of Cancer". *Macmillan, M. B.* 41
Therapy and Social Training for the Feebleminded Youth. *Günzburg, H. C.* .. . 42

VOL. 48 **BRIT. J. PSYCHOL.** FEBRUARY, 1957

Determinants of Emotionality in the Rat. I. Situational Factors. *Broadhurst, P. L.* .. 1
The Assessment of Anxiety as an Intervening Variable in the Delinquent Behaviour of M.D. Subjects. Galvanic Skin Response and Leg-persistence Indices. *Tong, J. E.* 13

Neuroticism in Children. I. An Investigation of Normal and Neurotic Group Differences. *Thorpe, J. G., and James, D. P.* 26
Cognitive Inference in Perceptual Activity. *Vernon, M. D.* 35
Personality and Perception: the Constancy Effect and Introversion. *Ardis, J. A., and Fraser, E.* 48
Visual Discrimination of Orientation by Octopus. *Sutherland, N. S.* 55

VOL. 21 **BULL. LOS ANGELES NEUR. SOC.** DECEMBER, 1956

Atrophy of Disuse as a Confusing Element in the Diagnosis of Peripheral Nerve Lesions. The Value of the Electromyogram in Evaluation of the Situation. *Marinacci, A. A.* 155
Malignancies of the Scalp with Invasion of Skull and Intracranial Space. Report of Four Cases with Necropsy Verification. *Courville, C. B.* 162
Retinal Arterial Pressure Studies Associated with Cervical Carotid Artery Occlusion in the Treatment of Cerebral Aneurysms. *Rand, R. W.* 175
Neuroradicular Amyloidosis. *Nielsen, J. M., and Marvin, S. L.* 188
Case Studies in Cerebral Anoxia. XII. Residual Cortical and Striatal Changes Consequent to Exposure to a Simple Asphyxiant Gas (Butane "Poisoning"). *Courville, C. B.* 192

VOL. 33 **CERVELLO** 1957

The Histopathology of the Central Nervous System in a Case of Infantile Encephalopathy. *Fattovich, G.* 1
On the Behaviour of Some Haematological Values in Mental Patients Treated by Reserpine. *Bisio, B.* 21
Clinical Considerations on the EEG in the Association of $Mg\ SO_4$ and Chlorpromazine in Epilepsy. *Maria, G.* 41
A Case of Medial Frontal Cholesteatoma. *Fattovich, G.* 78
Contribution to Knowledge of Visual Modifications in Emotional States Induced by Pharmacological Means. *Leoni, G.* 95
Research on the "Clearing Factor" in the Plasma and in the C.S.F. in Mental Illness Following the Administration of Heparin and after Psychotherapy. *Sacerdob, G.* 118

VOL. 17 **CONF. NEUROL.** 1957

The Effect of Chlorpromazine and the Modifying Action of Adrenaline on Human Capillaries. *Davis, E., et al.* 10
Experimental and Clinical Results Obtained by the Use of Recent Antiepileptic Substances. *Sorel, L.* 16
Pallidotomy and Pallido-Amygdalotomy in Certain Types of Convulsive Disorders. *Wycis, H. T., et al.* 43

VOL. 18 **DIS. NERV. SYST.** JANUARY, 1957

A Psychometric Concomitant of Bioccipital Spike Seizure Foci. *Roberts, A. C.* 7
Combination Reserpine-Methylphenidylacetate in Epileptics with Psychosis. *Niswander, G. D., and Holt, E. K.* 11
Chlorpromazine. *Sommerness, M. D., et al.* 16
Identifications and their Motivations. *Walters, T. A.* 20
Medicolegal Aspects of the Doctor-Patient Relationship. *Siegal, L. J.* 23
*Quiactin. *Feuss, C. D., and Gragg, L., jun.* 30
Proceedings of the Eastern Psychiatric Research Association. *Impastato, D. J.* 34

Quiactin: an Adjunct in the Treatment of Chronic Psychoses

Quiactin is a tasteless drug of low toxicity which appears pleasant to take. It seems to improve the behavior of irritable patients to an extent that cannot be explained by chance. Its best results seemed to be in cerebral arteriosclerotics, and it is believed that the drug offers much hope in these cases and in the milder psychiatric disorders. The oral dose is 0·8 Gm. to 4·8 Gm. per day.

(Authors' Abstr.)

FEBRUARY

Dynamic Psychologic and Somatic Treatment in Psychiatry. *Diethelm, O.* 49
Psychopathic Traits are Inheritable. *Newkirk, P. R.* 52
Effects of Physiodynamic Treatments in a Hospital Over a Ten-year Period. *Scherer, I. W., and Trehab, A.* 55
Measurement of Symptomatic Changes in Hospitalized Psychiatric Patients. *Hine, F. R., et al.* 58
Limited Goal Group Psychotherapy on a Locked Service. *Laffal, J., and Sarason, I. G.* 63
Communication in Brief Psychotherapy with the Non-psychotic Patient. *Whitaker, C. A.* 67
Proceedings of the Eastern Psychiatric Research Association. Neurologic Agents in Child Psychiatry. *Nichters, S.* 72

VOL. 9 EEG CLIN. NEUROPHYSIOL. FEBRUARY, 1957

A Topographical Study of Conditioned EEG Reaction in Man. *Gastaut, A., et al.* 1
The Electrical Responses of the Unanaesthetised Auditory Cortex in the Intact Cat. *Whitfield, I. C.* .. 35
The Action of Anticonvulsant Drugs Tested by Electrical Stimulation of the Cortex, Diencephalon and Rhinencephalon in the Unanesthetized Rabbit. *Gangloff, H., and Monnier, M.* .. 43
Variations in Arterial Pressure Caused by Epileptic Fits. *Morin, G., and Corriol, J.* .. 59
*Studies of Cerebral Circulation in Brain Injury. IV. Ischemia and Hypoxemia of the Brain Stem and Respiratory Center. *Meyer, J. S.* .. 83
*A Measurable Neurophysiological Factor of Psychiatric Significance. *Shagass, C.* .. 101
Electroencephalogram in Narcolepsy. *Daly, D. D., and Yoss, R. E.* .. 109
The Ontogenetic Development of Steady Potential Differences in the Cerebral Cortex in Animals. *Bures, J.* .. 121
The Relationship of Alpha Amplitude to the Level of Palmar Conductance. *Stennet, R. R.* 131
An Electromyographic Study of Induced and Spontaneous Muscle Cramps. *Norris, F. H., jr., et al.* .. 139

Studies of Cerebral Circulation in Brain Injury. IV. Ischemia and Hypoxemia of the Brain Stem and Respiratory Center

Concurrent studies of local blood flow, oxygen availability, steady potential (SP) and pH of the respiratory center and carotid body have been made together with continuous recording of blood pressure and respirations. The EPG electrode placed in the wall of the carotid artery records changes in the partial pressure of oxygen of the blood rather than changes in oxygen saturation.

The first effect of anoxic anoxia is stimulation of respiration by the carotid body reflex, continued anoxic anoxia or ischemic anoxia damages the respiratory center, resulting in various patterns of dysrhythmia such as slowed respiration. Cheyne-Stokes breathing, apneusis, gasping and finally respiratory arrest. Incomplete anoxia of the respiratory center causes respiratory arrest due to a state of reversible anoxic neuronal paralysis. In this state of reversible paralysis the respiratory neurones continue to metabolize oxygen but at a reduced rate. Anoxic damage to the respiratory center is associated with local acidity and hyperemia. Whenever respirations fail there is an accompanying injury potential (SP shift) of the respiratory center with respect to the spinal cord white matter.

Seven per cent. CO_2 and oxygen causes hyperpnea which appears to be mediated in the first few seconds by its action on the carotid body and later by its additional action on the respiratory center.

Occlusion of the carotid arteries causes hyperpnea which is mainly due to resultant hypoxemia of the carotid body. There is an increased blood flow in the collateral circulation from the vertebral, basilar and dorsal spinal arteries. Occlusion of the vertebral arteries causes incomplete ischemic anoxia of the brain stem. Respiration continues because the posterior communicating arteries provide a collateral circulation. Additional occlusion of the carotid arteries causes medullary anoxia and respiratory arrest.

Repeated anoxia lowers the threshold of the respiratory neurones to its paralytic effects. Patterns of periodic breathing, resulting from ischemia or anoxemia of the brain under the conditions of these experiments, do not appear to be mediated by periodic fluctuations of oxygen availability of carotid body and respiratory center or rhythmic fluctuations in pH of the respiratory center. They appear to result from anoxic damage to various levels of the brain stem and are reversible.

Brief carbon monoxide breathing lowers the oxygen saturation of the blood without reducing the partial pressure of blood oxygen, the oxygen dissolved in the plasma may provide a critical supply sufficient for the metabolic needs of the respiratory center as the normal oxygen carrying capacity of the blood is slowly restored.

(Author's Abstr.)

A Measurable Neurophysiological Factor of Psychiatric Significance

1. The sedation threshold is a clinical neurophysiological test, which determines the amount of intravenous amobarbital sodium required to produce certain EEG changes. accompanied by slurred speech. Previous investigations have shown the threshold to be related to several significant psychiatric variables, such as degree of manifest anxiety. The purpose of the present study was to further the aim of defining the neurophysiological factor, measured by the sedation threshold, by testing the hypothesis that the threshold is a function of the rate of depressant action of amobarbital on brain activity.

2. An acceptable index of rate of depressant action was required to test the hypothesis. Analysis of data from 399 psychiatric patients and 45 non-patient subjects showed that the amplitude of frontal fast frequency activity, produced by amobarbital, could provide such an index. The mean amplitude at the threshold, which represents a particular level of depressant action, was approximately constant for groups of subjects with different thresholds. The rate of increase of mean amplitude, which could be taken as the index of depressant action, was amenable to quantitative expression as the slope of a rectilinear function, when the logarithm of amplitude was used in calculation. In confirmation of the hypothesis, there was a highly

significant inverse correlation between the sedation threshold and this index of rate of depressant action.

3. In contrast to the sedation threshold, fast frequency amplitude as an absolute value, either before the injection or at threshold, was not significantly related to psychiatric diagnosis. Amplitude at threshold was correlated with amplitude before injection, but neither value was significantly correlated with the sedation threshold.

4. From the conclusion that the sedation threshold is a function of rate of depressant action of amobarbital, it was suggested that it measures a time characteristic of neuronal activity, which is probably an important factor influencing cerebral excitability. The extent to which the sedation threshold findings agree with neurophysiological theories of psychiatric disorder derived from behavioral observation was considered.

(Author's Abstr.)

VOL. 45 **ENCEPH.** 1956

Clinical Aspects of Recent Meningo-encephalitis of Unknown Origin but Deemed Viral in Western Europe. *van Bogaert, L.* 1267
Post-traumatic Diabetes Insipidus and Fatal Intracranial Hypotension. *Sizaret, P., and Vandier, H.* 1294
The Place of Electromyography in Neurology. *Thiebaut, F., et al.* 1300

VOL. 59 **FOL. PSYCHIAT. NEUR. NEUROCHIR. NEERL.** DECEMBER, 1956

The Amygdaloid-Nuclear Complex. *Magnus, O., and Lammers, H. J.* 555
The Human Ego and Psycho-analysis. *Dempsey, P. J. R.* 583
Root Syndromes and "Low Back Pain". *Hanraets, P. R. M. J.* 599

VOL. 55 **GENET. PSYCHOL. MONOGR.** FEBRUARY, 1957

Academic Performance and Personality Adjustments of Highly Intelligent College Students. *Horrall, B. M.* 3
The Use of the Vineland Social Maturity Scale in the Planning of an Educational Program for Non-Institutionalized Low-grade Mentally Deficient Children. *Gottsegen, M. G.* 85

VOL. 84 **GIORN. PSICHIAT. NEUROPATOL.** 1956

Studies on the Effects of Enteramine on the Central Nervous System. *Ferro Milone, F., and Gomirato, G.* 449
Manifestations from the Central Nervous System during the Course of Pulmonary Tuberculosis, Encephalomyelitis and Tubercular Encephalitis. *Rossini, R., and Alvisi, C.* 467
Researches on the Leucocyte Peroxidases in Progressive Muscular Dystrophy. *Calvi, L. A., and Terranova, R.* 503
Meningiomas of the Olfactory Tract. *Dazzi, P.* 517
Short Considerations on the Clinical and EEG Aspects in Thirty Cases of Acute Infantile Encephalopathy. *Corsino, G. M., and Lugaresi, E.* 569
Clinical and EEG Data in Cases of Infantile Epilepsy. *Corsini, G. M., and Lugaresi, E.* 581
Chlorpromazine and the Neuro-vegetative System in Epileptics. *Donegani, G., and Sapegno, V.* 595
The Action of Diphenylhydantoin on the Vestibulo-cerebellar System. *Vettori, D.* 621
Writer's Cramp. *Ferrari, D.* 675
The Syndrome of Ramsay Hunt with Paralysis of Several Cranial Nerves, etc. *Turinese, A.* 695
Spinal Muscular Atrophy. *Zanocco, G.* 707
Neurological Symptoms Following Sympathetic Gangliectomy. *Campanini, T., et al.* 735
The Analytical Study of the Galvanic Skin Response during Examination with the Rorschach Test. *Missaglia, A.* 751
An Experimental Contribution to the Study of Local Anaphylaxis of the Central Nervous System. *Andreani, G.* 827

VOL. 37 **INTERNAT. J. PSYCHO-ANAL.** NOV.-DEC., 1956

The Development of the Ego Concept in Freud's Work. *Hartmann, H.* 425
Re-evaluation of the Process of Working Through. *Greenacre, P.* 439
On Some Vicissitudes of Insight in Psycho-analysis. *Kris, E.* 445
The Role of Identification in Psycho-analytic Procedure. *Lampl-de Groot, J.* 456
Some Remarks on the Role of Speech in Psycho-analytic Technique. *Loewenstein, R. M.* 460
The Nature and Function of the Analyst's Communication to the Patient. *Rycroft, C.* 469

VOL. 53 **J. AB. SOC. PSYCHOL.** NOVEMBER, 1956

Ideology, Personality, and Institutional Policy in the Mental Hospital. *Gilbert, D. C., and Levinson, D. J.* 263
Personality Structure and Group Structure: An Interpretative Study of Their Relationship Through an Event-Structure Hypothesis. *Tannenbaum, A. S., and Allport, F. H.* 272
Stimulus Generalization as a Function of Clinical Anxiety. *Rosenbaum, G.* 281

Distractibility in the Conceptual Performance of Schizophrenics. *Chapman, L. J.* .. 286
Scaling Norm Conflicts in the Area of Prejudice and Discrimination. *Kogan, N., and Downey, J. F.* 292
Development and Evaluation of a Scale for Measuring Social Acquiescence. *Bass, B. M.* 296
Pride in Group Performance and Group-Task Motivation. *Berkowitz, L., and Levy, B. I.* 300
Effects of Work-Group Structure and Certain Task Variables on Group Performance. *Lanzetta, J. T., and Roby, T. B.* 307
Effects of Glutamic Acid and Social Stimulation in Mental Deficiency. *Chambers, G. S., and Zabarenko, R. N.* 315
Retention of Affectively Toned Verbal Material by Normals and Neurotics. *Klugman, S. F.* 321
Reminiscence, Drive, and Personality Theory. *Eysenck, H. J.* 328
Perceptual Organization and Intelligence: A Further Study. *DeSoto, C., and Leibowitz, H.* 334
Impressions of Personality, Authoritarianism, and the *Fait-Accompli* Effect. *Paul, I. H.* 338
Relations of Temperament to the Choice of Values. *Jones, L. V., and Morris, C.* .. 345
Enhancement of Contrast as Composite Habit. *Campbell, D. T.* 350
A Factorial Study of Dogmatism and Related Concepts. *Rokeach, M., and Fruchter, B.* 356
Performance as a Function of Motive Strength and Expectancy of Goal-Attainment. *Atkinson, J. W., and Reitman, W. R.* 361
Cognitive Structure and Attitudinal Affect. *Rosenberg, M. J.* 367
The Effects of Emotional Arousal on the Retention of Film Content: A Failure to Replicate. *Maccoby, E. E., et al.* 373

VOL. 54 JANUARY, 1957

Development and Validation of a Projective Measure of Power Motivation. *Veroff, J.* 1
GSR Reactivity as a Function of Anxiety, Instructions, and Sex. *Berry, J. L., and Martin, B.* 9
The Relationships Among Imaginative, Direct Verbal, and Physiological Measures of Anxiety in an Achievement Situation. *Raphelson, A. C.* 13
Conditioning of a Response Class on a Personality Test. *Nuthmann, A. M.* 19
The Generality of Attitudes Toward Authority and Nonauthority Figures. *Burwen, L. S., and Campbell, D. T.* 24
Guessing Behavior and Autism. *Solley, C. M., et al.* 32
Accuracy of Interpersonal Prediction as a Function of Judge and Object Characteristics. *Baker, B. O., and Block, J.* 37
*Differences Between Schizophrenic and Brain-Damaged Groups in Conceptual Aspects of Object Sorting. *McGaughran, L. S., and Moran, L. J.* 44
A Comparison Between Ipsative and Normative Ratings of Personality. *Block, J.* .. 50
The Effects of Group Expectations and Self-Esteem Upon Self-Evaluation. *Stotland, E., et al.* 55
Age Differences in Verbal Learning. *Korchin, S. J., and Basowitz, H.* 64
Personality, Problem Solving, and the Einstellung Effect. *Maher, B. A.* 70
On the Relation Between the Probability of a Word as an Association and in General Linguistic Usage. *Howes, D.* 75
Looking at Occupations. *Grunes, W. F.* 86
Age Differences in the Perception of Closure. *Basowitz, H., and Korchin, S. J.* .. 93
Post-decision Exposure to Relevant Information. *Ehrlich, D., et al.* 98
A New Look at Vigilance and Defense. *Spence, D. P.* 103
Practice Effects in Reaction-Time Tasks in Brain-Injured Patients. *Benton, A. L., and Blackburn, H. L.* 109
A Test of the Taylor-Spence Theory of Anxiety. *Saltz, E., and Hoehn, A. J.* 114
Breadth of Deviate Concepts Used by Schizophrenics. *Chapman, L. J., and Taylor, J. A.* 118

Difference Between Schizophrenic and Brain-Damaged Groups in Conceptual Aspects of Object Sorting

This was a study of difference in object-sorting behavior between schizophrenic and brain-damaged groups with respect to two conceptual variables—amount of social agreement and order of conceptual classification. It was hypothesized that the brain-damaged group shows a significantly lower order of conceptual classification than does the schizophrenic group.

The variable, social agreement, was scored in terms of the relative publicness-privateness of each conceptual sorting. The second variable, order of classification, was scored in terms of the number of attributes used in the definition. In addition to these two measures, five others were derived from the interaction of the two variables.

An analysis of covariance (controlling for intelligence) indicated that all six measures for which hypotheses were formulated yielded results in the predicted direction and that four of these mean differences were significant at the ·01 level, or better. The greatest F ration was for the closed-open variable, in keeping with the major hypothesis. Differences on all of the measures, except public-private, were greatest between the schizophrenic and brain-damaged groups with the results of the non-psychiatric group falling in between.

(Authors' Abstr.)

VOL. 13 J. CLIN. PSYCHOL. JANUARY, 1957

Therapy with Physically and Mentally Handicapped Children in a Mental Deficiency Hospital. *Mundy, L.*	3
Changes in Adjustment of Institutionalized Female Defectives Following Group Psychotherapy. *Wilcox, G. T., and Guthrie, G. M.*	9
Persuasive Doll Play: A Technique of Directive Psychotherapy for Use with Children. *Mann, L.*	14
Success and Satisfaction in Psychotherapy. *Cartwright, D. S., and Roth, I.*	20
Role and Status Structure in Therapy Groups. *Talland, G. A.*	27
The Projective Expression of Patient-Therapist Attraction. *Libo, L. M.*	33
A Survey of "Referral Problems" in Metropolitan Child Guidance Centers. *Gilbert, M. G.*	37
Some Features of Child Guidance Clinic Practice in the U.S.A. *Phillips, E. L.*	42
Correlates of Certain Subjective Attitudes toward Self and Others. *Fey, W. F.*	44
The Specificity of the Psychiatric Interview. *Hunt, W. A., et al.*	49
A Method of Assessing Capacity in Pre-school Cerebral Palsied Children. *Kogan, K. L.*	54
Leisure Activities in Relation to Neuropsychiatric Diagnosis and Treatment. *Robertson, J. P. S.*	56
Prediction of the Response of Chronic Schizophrenics to Drug Therapy. *Ellsworth, R. B., and Clark, L. D.*	59
Individual Variance Score: An Index of the Degree of Differentiation of the Self and the Body Image. *Jourard, S. M., and Remy, R. M.*	62
A Proposal for "Testing the Limits" with Mental Defectives for Purposes of Subtest Analysis of the WISC Verbal Scale. *Volle, F. O.*	64
Evaluation of an Abbreviated WAIS in a Psychiatric Population. *Himelstein, P.*	68
A Comparison of Four Verbal Subtests on the Wechsler-Bellevue, Form I, and the WAIS. *Dana, R. H.*	70
Preliminary Study of Comparison Between Wechsler Intelligence Scale for Children and Form L of Revised Stanford Binet Scale at Three Age Levels. *Harlow, J. E., jr., et al.*	72
Popular Responses for the Despert Fables. *Peixotto, H. E.*	73
A Comparison of Rorschach and Howard Tests on a Schizophrenic Population. *Scott, E. M., and Douglas, F.*	79
Some Advances in Interpretation of the Chromatic Phase of the H-T-P. *Jolles, I.*	81
Rorschach Sex Responses and Overt Deviation. *Cutter, F.*	83
Sexual Differentiation of Male and Female Job Applicants on the Draw-a-Person Test. *Murphy, M. M.*	87
Time Estimation of Schizophrenics and Non-Psychotics. *Rabin, A. I.*	88
Are Enuretics Suitable for the Armed Services? *Harris, D. H., and Firestone, R. W.*	91
Education, Intelligence and Military Recruit Performance. *Firestone, R. W.*	93
A Note on Recall Patterns Using the Bender-Gestalt with Psychotic and Non-Psychotic Patients. *Stewart, H. F.*	95

APRIL

The Uniqueness of Configural Test Item Scores. *Horst, P.*	107
Statistics for the Investigation of Individual Cases. *Payne, R. W., and Jones, H. G.*	115
Some Patterns of Depression. *O'Connor, J. P., et al.*	122
The Abstract Thinking Abilities of Mental Patients. *Karson, S., and Pool, K. B.*	126
Factor Analysis of a Particular Aspect of Behavioral Control: Impulsivity. *Twain, D. C.*	133
The Altitude Quotient as a Measurement of Intellectual Potential. *Brown, M. H., and Bryan, G. E.*	137
Reactions of Men Under Stress to a Picture Projective Test. *Cline, V. B., et al.*	141
A Criterion Measure of Within-Hospital Change in Psychiatric Illness. *Gordon, M. H., et al.*	145
A Study of Functional Relationships among Measures of Anxiety, Ego Strength and Adjustment. *Ends, E. J., and Page, C. W.*	148
Relationship of Cornell Medical Index Responses to Post-surgical Invalidism. *Bard, M., and Waxenberg, S. E.*	151
The Validity of Shoben's Parent Attitude Survey. *Gordon, J. E.*	154
An Evaluation of the Construct Validity of Barron's Ego-Strength Scale. *Tamkin, A. S.*	156
Differential Classification of Hebephrenic and Paranoid Schizophrenics from Case Material. *Orgel, S. A.*	159
The Stability of Tree Drawings as Related to Several Rorschach Signs of Rigidity. *Tolor, A.*	162
Relation between MMPI Scores and Musical Projective Test Scores. *Sopchak, A. L.*	165
The Validity of Interpretive Signs of Aggression in the Drawing of the Human Figure. *Goldstein, A. P., and Rawn, M. L.*	169
Stimulus-Determinants of Shading Responses. *Eckhardt, W.*	172
The Sentence Composition Test. *Michaux, W. W.*	174
Structural Properties of Bender-Gestalt Test Associations. *Tolor, A.*	176
Repeated Testing of Four Chronic Schizophrenics on the Bender-Gestalt and Wechsler Block Design Tests. *Keehn, J. D.*	179

Recall of the Bender-Gestalt Designs by Organic and Schizophrenic Patients: A Comparative Study. *Reznikoff, M., and Olin, T. D.* 183
The Porteus Mazes and Bender-Gestalt Recall. *Aaronson, B. S.* 186
The Effects of Reserpine on Psychotic Patients of Varying Degrees of Illness: A Pilot Study. *Hauck, P., et al.* 188
An Exploratory Study of Some Personality Characteristics of Gamblers. *Morris, R. P.* 191
A Case of Anorexia Nervosa in a 16 Year Old Girl. *Arnhoff, F. N.* 194
An Alphabetical List of MMPI Items. *Kimber, J. A. M.* 197
Relationship Between Intelligence and Frustration-Aggression Patterns as Shown by Two Racial Groups. *McCary, J. L., and Tracktir, J.* 202

VOL. 105 J. COMP. NEUR. OCTOBER, 1956

Caliber Spectra of Nerve Fibers in the Pigeon (*Columba domestica*). *Graf, W.* .. 355
*Some Results Obtained by Electrical Stimulation of the Cortex of the Island of Reil in the Brain of the Monkey (*Macaca mulatta*). *Frontera, J. G.* 365
Neuroanatomical Distribution of Action Potentials Evoked by Photic Stimuli in Cat Fore- and Mid-brain. *Harman, P. J., and Berry, C. M.* 395
Commissural Connections of the Hippocampal Region in the Rat, with Special Reference to Their Mode of Termination. *Blackstad, T. W.* 417
*Differential Growth of the Human Brain. *Noback, C. R., and Moss, M. L.* 539
The Phrenic Nucleus of the Macaque. *Warwick, R., and Mitchell, G. A. G.* 553
On the Nerve Supply of the Lung of the Mouse, with Special Reference to the Structure of the Peripheral Vegetative Nervous System. *Honjin, R.* 587

Some Results Obtained by Electrical Stimulation of the Cortex of the Island of Reil in the Brain of the Monkey (*Macaca mulatta*)

1. The opercularized island of Reil in the lower primates (monkeys) represents the territory of the anterior Sylvian and anterior ectosylvian gyri of non-primates. In addition, monkeys have a fairly extensive non-opercularized island extending rostrally to the fronto-orbital sulcus which apparently is the homologue of the presylvian sulcus of lower forms.

2. The covered insula enlarges through the primate series at the expense of adjacent territory, which includes rostrally that up to the fronto-orbital sulcus, which finally becomes part of the anterior limiting sulcus and the anterior ascending ramus of the lateral fissure in man.

3. As a result of this growth of the insular territory, the whole covered insula of monkeys lies immediately rostral to the central sulcus of the human island of Reil, probably within the short gyrus nearest the former sulcus, and is, by definition, part of the anterior insula of man, which has almost typical agranular isocortex.

4. Although somatic motor movements of the ipsilateral and contralateral face, and contralateral upper and lower extremities were obtained, in that sequence, by stimulating in rostrocaudal order the strip of island cortex covered by the temporal operculum, these results, obtained only with an inductorium in animals under ether narcosis, are not constant enough to advocate the presence of a somatic motor field in the above mentioned region.

5. With ether and various barbiturates as anesthesia, use of a square wave stimulator produced responses only from the area which previously yielded upper extremity movements when the inductorium was used. The nature of these movements with the former stimulator was different. It was bilateral and can be best described as shivering, usually preceded by pil-erection over both shoulders and as far down as the upper two-thirds of the arm. Occasionally, arrest of respiration at inspiration and salivation were also observed from the same and adjacent areas.

(Author's Abstr.)

Differential Growth of the Human Brain

1. The growth of the human brain is analysed by the differential growth equation. By this method the ratios of the specific growth rates (gradients of growth) of 14 dimensions of the brain were determined for the period from the end of the second fetal month to the adult stage.

2. With two exceptions, the ratios of the specific growth rates of these dimensions are constantly proportional throughout the period.

3. Each of the two exceptions, the corpus callosum and the width of the cerebellum, has two gradients of growth separated by an interphase. The interphase for the cerebellum occurs at the end of the 4th fetal month and for the corpus callosum at the end of the 5th fetal month. The interphase for the corpus callosum apparently coincides with the appearance of its full complement of nerve fibers. No morphological factor is known to be responsible for the cerebellar interphase.

4. Alterations in the shape of the brain during ontogeny result from changes in the relative proportionality of its components and the expression of the integration of these changes is the constant ratio between the specific growth rates of these components of the brain.

(Authors' Abstr.)

NOVEMBER

Experimental Degeneration of the Vagus, and Its Relation to the Nerve Supply of the Lung of the Mouse, with Special Reference to the Crossing Innervation of the Lung by the Vagi. *Honjin, R.* 1
Areal Distribution of Axonal and Dendritic Patterns in Inferior Olive. *Scheibel, M., et al.* 21
Afferent Connections to the Sensory Trigeminal Nuclei, the Nucleus of the Solitary Tract and Adjacent Structures. An Experimental Study in the Rat. *Torvik, A.* 51
Functional Recovery Following Alterations in Nerve-Muscle Connections of Fishes. *Sperry, R. W., and Deupree, N.* 143
An Oscillographic Study of the Central Pathways of the Vagus Nerve in the Cat. *Anderson, F. D., and Berry, C. M.* 163
*Subcortical Projections from the Temporal Neocortex in Macaca mulatta. *Whitlock, D. G., and Nauta, W. J. H.* 183
Localization of Brain Stem and Diencephalic Areas Controlling the Micturition Reflex. *Tang, P. C., and Ruch, T. C.* 213
Correlations Between the Physiological Changes and the Morphological Changes Resulting from Axotomy in the Inferior Mesenteric Ganglion of the Cat. *Acheson, G. H., et al.* 247

Subcortical Projections from the Temporal Neocortex in Macaca mulatta

Eight Macaca mulatta brains containing surgical lesions of various parts of the temporal neocortex were studied by the aid of the Nauta-Gygax staining technique for degenerative axons. All of the temporal areas studied were found to project to the ventral part of the putamen and to the pulvinar. Additional projections appeared as follows: the convexity of the superior temporal gyrus projects to the medial geniculate body, superior colliculus, intercollicular nucleus, and lateral region of the rostral midbrain tegmentum. Very sparse projections were traced to the pons and inferior colliculus. Projections from the temporal pole pass to the superior colliculus, zona incerta and adjoining parts of lateral midbrain tegmentum. The middle temporal gyrus projects to the tail of the caudate nucleus, to the pretectal area and superior colliculus, and through the inferior thalamic peduncle to the dorsomedial thalamic nucleus. The inferior temporal gyrus projects to the basolateral amygdaloid nuclei, substantia innominata and dorsomedial thalamic nucleus, and to the tail of the caudate nucleus, with minor projections to the reticular thalamic nucleus and zona incerta. Numerous afferents from the middle and inferior temporal convolutions contribute to the anterior commissure.

(Authors' Abstr.)

VOL. 49 J. COMP. PHYSIOL. PSYCHOL. OCTOBER, 1956

Dark Adaptation in the Pigeon. *Blough, D. S.* 425
A Comparison of the Variability of Binocular and Monocular Threshold Measurements During Dark Adaptation in the Human Eye. *Forbes, L. M., and Mote, F. A.* .. 431
Foveal Luminance Discrimination as a Function of the Duration of the Decrement or Increment in Luminance. *Herrick, R. M.* 437
Manipulatory Motivation in the Infant Rhesus Monkey. *Harlow, H. F., et al.* .. 444
Learning Capacities of the Infant Rhesus Monkey. *Mason, W. A., et al.* 449
Behavior Effects in the Offspring of Rats Subjected to Audiogenic Seizure During the Gestational Period. *Thompson, W. D., jr., and Sontag, L. W.* 454
An Experimental Investigation of the Role of Psychological Factors in the Production of Gastric Ulcers in Rats. *Sawrey, W. L., et al.* 457
The Effect of the Presence of the Mother on Abnormal Behavior in the Rat. *Lubow, R. E., and Marcuse, F. L.* 462
The Effect of a Conflict Situation on Learning Ability in Two Strains of Inbred Mice. *King, J. A., and Mavromatis, A.* 465
Time Discrimination and Behavioral Interaction in a Free Operant Situation. *Murray, S.* 469
Speed of Running as a Function of Goal-Box Behavior. *Kling, J. W.* 474
Learning Without Response Under Two Conditions of External Cues. *McNamara, H. J., et al.* 477
Visual Discrimination Learning as a Function of Shock-Fear and Task Difficulty. *Hammes, J. A.* 481
The Relationship Between Training Methods and Reward Variables in Brightness Discrimination Learning. *McKelvey, R. K.* 485
Simple Color Discrimination in Chimpanzees: Effect of Varying Contiguity Between Cue and Incentive. *Jarvik, M. E.* 492
Secondary-Reinforcement Stimulation Throughout a Series of Spontaneous Recoveries. *Miles, R. C.* 496
Problem-Solving Behavior of Monkeys as a Function of Work Variables. *Davis, R. T.* 499
Runway and Maze Behavior Controlled by Basomedial Forebrain Stimulation in the Rat. *Olds, J.* 507

Studies in the Neurophysiology of Learning: III. Further Data on the Effect of Brain Stimulation During Black-White Discrimination on Learning Behavior in the White Rat. *Gengerelli, J. A., and Mower, R. D.* 513
Interocular Transfer of Habits in Cats After Alternating Monocular Visual Experience. *Riesen, A. H., and Mellinger, J. C.* 516
Learned Performance of Monkeys After Single and Repeated X Irradiations. *Riopelle, A. J., et al.* 521
The Effects of Cranial X Radiation on Retention of Maze Learning in Rats. *Blair, W. C., and Arnold, W. J.* 525

DECEMBER

Relearning Tests for Interocular Transfer Following Division of Optic Chiasma and Corpus Callosum in Cats. *Sperry, R. W., et al.* 529
Effect of a Glaring Light Source on the Human Electroretinogram. *Crampton, G. H.* 534
Discrimination Reversal Learning in Marmosets. *Cotterman, T. E., et al.* 539
Patterning Effect of the Nonreinforcement-Reinforcement Sequence in a Discrimination Situation. *Grosslight, J. H., and Radlow, R.* 542
The Effect of Problem Difficulty on Discrimination Reversal. *Hoffman, F. K., et al.* .. 547
The Effects of Hunger and Familiarity of Locale on Exploration. *Fehrer, E.* 549
Effects of Drive Level and Experience on the Reward Value of Saccharine Solutions. *Smith, M. P., and Capretta, P. J.* 553
Effects of Intravenous Glucose Injections on Learning, General Activity, and Hunger Drive. *Chambers, R. M.* 558
Some Physiological Bases for Reinforcing Properties of Reward Injections. *Chambers, R. M.* 565
The Relative Acceptability of Sodium Chloride Solutions as a Function of Concentration and Water Need. *Young, P. T., and Falk, J. L.* 569
Effect of Extinction of Dipper-Approaching on Subsequent Extinction of Bar-Pressing and Dipper-Approaching. *Ratner, S. C.* 576
The Relationships Among Three Measures of Response Strength as a Function of the Numbers of Reinforcements. *Kobrick, J. L.* 582
Proportional Reinforcement of Irrelevant Stimuli and Transfer Value. *Babb, H.* .. 586
Investigations of the Behavior of *Paramecium Aurelia*: II. Modification of a Response in Successive Generations of Both Mating Types. *Gelber, B.* 590
Investigations of the Behavior of *Paramecium Aurelia*: V. The Effects of Autogamy (Nuclear Reorganization). *Gelber, B., and Rasch, E.* 594
The Effect of Total-Body X Irradiation on Delayed-Response Performance of Dogs. *DiMascio, A., et al.* 600

VOL. 50 FEBRUARY 1957

Thirst-Reducing Effects of Water by Stomach Fistula *vs.* Water by Mouth Measured by Both a Consummatory and an Instrumental Response. *Miller, N. E., et al.* .. 1
Imprinting: The Interaction of Learned and Innate Behavior: II. The Critical Period. *Jaynes, J.* 6
The Formation of Learning Sets in Rats. *Koronakos, C., and Arnold, W. J.* 11
Learning Set in Preschool Children. *Shepard, W. O.* 15
A Discrimination Based upon Repeated Conditioning and Extinction of Avoidance Behavior. *Boren, J. J., and Sidman, M.* 18
Patterning Effect of the Nonreinforcement-Reinforcement Sequence Involving a Single Nonreinforced Trial. *Grosslight, J. H., and Radlow, R.* 23
The Behavior of Cats on the Double-Alternation Problem. *Stewart, C. N., and Warren, J. M.* 26
An Experimental Comparison of Secondary Inhibition and Secondary Reinforcement. *Levy, N.* 29
Brightness Discrimination Performance and Secondary Reward Strength as a Function of Primary Reward Amount. *Lawson, R.* 35
Reinforcing Properties of the Termination of Intense Auditory Stimulation. *Barnes, G. W., and Kish, G. B.* 40
An Exploration of Somatic Response Patterns: Stimulus and Sex Differences. *Davis, R. C., and Buchwald, A. M.* 44
The Pattern of Somatic Response During a Repetitive Motor Task and Its Modification by Visual Stimuli. *Davis, R. C., et al.* 53
The Effect of Frequency of Intermittence upon Perceived Brightness. *Battig, W. F., et al.* 61
Consumption of Sucrose and Saccharine by Hungry and Satiated Rats. *Smith, M., and Duffy, M.* 65
Modification of Sexual Behavior of the Male Albino Rat. *Hayward, S. C.* 70
A Comparison of the Effects of Medial and Lateral Cerebral Resections on Conditioned Avoidance Behavior of Monkeys. *Pribram, K. H., and Weiskrantz, L.* 74
Effects of Prefrontal Lobotomy on Conditioned Fear and Food Responses in Monkeys. *Waterhouse, I. K.* 81

The Effect on Affective and Cognitive Behavior in the Dog of Lesions of the Pyriform-Amygdala-Hippocampal Complex. *Fuller, J. L., et al.*	89
The Effect of Electroconvulsive Shock on Fixated Behavior of the Rat: III. The Effect of ECS as a Function of the Duration of Conflict. *Feldman, R. S., and Neet, C. C.*	97
The Effect of Conventional Electroconvulsive Shock (ECS) *vs.* "Brief Stimulus Therapy" (BST) on Memory and Nest-Building in Albino Rats. *Docter, R. F.*	100
Behavior Variability and Reactive Inhibition in the Maze Behavior of *Planaria Dorotocephala. Rice, G. E., jr., and Lawless, R. H.*	105

VOL. 27 J. EDUC. PSYCHOL. FEBRUARY, 1957

Recent Developments in Piaget's Work. *Berlyne, D. E.*	1
The Interests of Children (aged 10-11) in Books. *Carsley, J. D.*	13
The Prospect of Marriage: A Study of the Attitudes towards Further Education of a Sample Group of Secondary Technical and Secondary Grammar School Leavers. *Gallagher, M.*	24
Differences between Schools for the Maladjusted and Ordinary Boarding Schools. *Pringle, M. L. K.*	29
Symposium: The Use of Essays in Selection at 11+. IV. Experimental Inquiries into the Use of Essay-Type English Papers. *Pidgeon, D. A., and Yates, A.*	37
The Distribution of Personality Traits in Seven-Year-Old Children: A Combined Psychological, Psychiatric and Somatotype Study. *Davidson, M. A., et al.*	48
Temperamental Characteristics Related to Disparity of Attainment in Reading and Arithmetic. *Lynn, R.*	62

VOL. 52 J. EX. PSYCHOL. DECEMBER, 1956

Further Tests of Theories of Decision in an "Expanded Judgment" Situation. *Irwin, F. W., and Smith, W. A. S.*	345
Effects of Contiguity and Similarity on the Learning of Concepts. *Newman, S. E.*	349
Magnitude of Response to Compounds of Discriminated Stimuli. *Grings, W. W., and O'Donnell, D. E.*	354
A Reappraisal of the Transfer and Retroaction Surface. *Bugelski, B. R., and Cadwallader, T. C.*	360
Transfer of Training to Orthogonal Dimensions. *Riopelle, A. J., and Rogers, J. P.*	367
Verbal Response Strength as a Function of Cultural Frequency, Schedule of Reinforcement, and Number of Trials. *Peterson, M. J.*	371
Prediction of Critical Events in Contexts of Different Numbers of Alternative Events. *Schipper, L. M.*	377
Effect of Punishment on Visual Discrimination Learning. *Prince, A. I., jr.*	381
The Associative Factor in Eyelid Conditioning. *Kimble, G. A., and Dufort, R. H.*	386
Skin Conductance and Peripheral Vascular Reactions. *Du Toit, J. M.*	392
Effects of Visual, Vestibular, and Somatosensori-Motor Deficit on Autokinetic Perception. *Battersby, W. S., et al.*	398

VOL. 53 JANUARY 1957

The Role of Redundancy in the Discrimination of Visual Forms. *Rappaport, M.*	3
Stimulus Recall Following Paired-Associate Learning. *Feldman, S. M., and Underwood, B. J.*	11
The Role of Meaningfulness (*m*) in Paired-Associate Verbal Learning. *Noble, C. E., and McNeely, D. A.*	16
A Re-Examination of Rubin's Figural After-effect. *Rock, I., and Kremen, I.*	23
Experiments on Figural Dominance. *Künnapas, T. M.*	31
Reinforcement of Verbal Behavior. *McNair, D. M.*	40
The Effort Variable in the Acquisition, Extinction, and Spontaneous Recovery of an Instrumental Response. *Aiken, E. G.*	47
Self-Pacing Performance as a Function of Perceptual Load. *Conrad, R., and Hille, B. A.*	52
Stimulus Conditions and Retroactive Inhibition. *Greenspoon, J., and Ranyard, R.*	55
Retroactive Inhibition as a Function of the Degree of Original and Interpolated Learning. *Briggs, G. E.*	60
The Relation of Decision-Time to Stimulus Similarity. *Dember, W. N.*	68

FEBRUARY

Probability and Work as Determiners of Multichoice Behavior. *Detambel, M. H., and Stolurow, L. M.*	73
Relations of Creative Responses to Working Time and Instructions. *Christensen, P. R., et al.*	82
Effects of Experience on Perception of Causality. *Gruber, H. E., et al.*	89
A Measure of Stimulus Similarity and Errors in Some Paired-Associate Learning Tasks. *Rothkopf, E. Z.*	94
The Role of Context Stimuli in Verbal Learning. *Peterson, L. R., and M. J.*	102
Strength of Secondary Reinforcement as a Determiner of the Effects of Duration of Goal Response on Learning. *Powell, D. R., jr., and Perkins, C. C., jr.*	106

Muscular Tension and the Human Blink Rate. *King, D. C., and Michels, K. M.* .. 113
Effect of Food, Drink, and Tobacco Deprivation on the Conditioning of the Eyeblink Response. *Franks, C. M.* .. 117
The Effect on Problem Solving of Success or Failure as a Function of Cue Specificity. *Rhine, R. J.* .. 121
Motivational Properties of Frustration: III. Relation of Frustration Effect to Antedating Goal Factors. *Amsel, A., and Hancock, W.* .. 126
Anchor Effects in Absolute Judgments. *Eriksen, C. W., and Hake, H. W.* .. 132
Stimulus Generalization After Equal Training on Two Stimuli. *Kalish, H. I., and Guttman, N.* .. 139
Dynamic Contour Perception. *Smith, W. M., and Gulick, W. L.* .. 145

VOL. 89 J. GENET. PSYCHOL. DECEMBER, 1956
The Effect of a Series of Electroconvulsive Seizures on Some Measures of Activity in the Male Albino Rat. *Stern, J. A.* .. 141
A Functional Approach to Clinical Psychology. *Luchins, A. S.* .. 153
Experimental Inhibition and Restoration of Mating Behavior in Male Rats. *Beach, F. A., et al.* .. 165
The Relationship of Place and Turn Alternation to Reactive Inhibition. *House, B. J.* 183
Patterns of Aggression in Parents and Their Children. *Hess, R. D., and Handel, G.* .. 199
Electroconvulsive Shock and the Learning of Visual Patterns. *Brown, W. L., and Simpson, A. D., jr.* .. 213
The Structural Aspects of Schizophrenic Responses to auditory Stimuli. *Friedman, H.* 221
Age and Suitability for Nondirective Play Therapy. *Lebo, D.* .. 231
An Assessment of Personal-Social Adjustments of a Group of Middle-Class Mothers. *Crandell, V. J., and Preston, A.* .. 239
WISC Scores and Status in Reading and Arithmetic of Delinquent Children. *Richardson, H. M., and Surko, E. F.* .. 251
Trends in the "Fears and Worries" of School Children as Related to Socio-economic Status and Age. *Angelino, H., et al.* .. 263

VOL. 56 JANUARY, 1957
Perceptual Autism in Children. *Solley, C. M., and Sommer, R.* .. 3
Comment Upon Three Dimensions of Self-Attitude and Anxiety. *Albert, R. S.* .. 13
The Development of a Test of Criminal Cant. *Russell, H. E., and Bendig, A. W.* .. 21
Relation Between Word Variety and Mean Letter Length of Words with Chronological and Mental Ages. *Smith, M. E.* .. 27
Reward *vs.* Punishment: Comment on a Confusion. *Bevan, W.* .. 45
The Function of the Mosaic Test in Clinical Practice. *Johnson, T. F.* .. 51
Net Discriminatory Reaction Potential as a Function of Stimulus Separation Along an Intensive Stimulus Continuum. *Passey, G. E.* .. 59
Higher-Order Conditioning in the Monkey. *Murphy, J. V., and Miller, R. E.* .. 67
A Critique and Re-evaluation of Witkin's Perception and Perception-Personality Work. *Gruen, A.* .. 73
The Effect of the Emotional Tone of Words Upon the Vocabulary Responses of Schizophrenics. *Richman, J.* .. 95
The Relationship Between Certain Measures of Ability and the Acquisition of a Psychomotor Criterion Response. *Adams, J. A.* .. 121

VOL. 123 J. NERV. MENT. DIS. MAY, 1956
The Contribution of Psychoanalysis to the Medical Study of Behavior. *Rado, S.* .. 421
Prognosis in Head Injuries in Children. *Fabian, A. A.* .. 428
Psychobiological Implications in Insulin Therapy with Children. *Mechlow, J.* .. 432
Korsakoff and Wernicke Syndromes: History and Treatment. *Sikes, Z. S.* .. 448
The Physiology of Hemiplegia and Athetosis. *Stanley-Jones, D.* .. 452
Marital Status and Mental Disease Among Negroes in New York State. *Malzberg, B.* 457
Borderline States. *Shenken, L.* .. 466
Chemotherapy with Azacyclonol in Mental Illness. *Niswander, G. D., and Holt, E. K.* 473
*Chlorpromazine (Thorazine) and Reserpine in Residential Treatment of Neuropsychiatric Disorders in Children. *Miksztal, M. W.* .. 477
Seasonal Variation in Military Neuropsychiatric Admissions. *Chambers, W. N.* .. 480
Cardiac Conditional Reflexes Can be Formed to Pain but Not to Acetylcholine. *Teitelbaum, H. A., et al.* .. 484
An Approach to Electroshock Therapy with the Use of Anticonvulsants. *Bloom, D.* 491

Chlorpromazine (Thorazine) and Reserpine in Residential Treatment of Neuropsychiatric Disorder in Children

In this study of the 74 children treated with reserpine or Thorazine, marked or moderate improvement has occurred in 65 to 81 per cent. of the cases, depending upon type of diagnostic group and the particular drug. It can be concluded that chemotherapy seems to be of definite value as an adjunct in the treatment of schizophrenic children. Although by its action, the drugs do not alter the schizophrenic process, they can eliminate or reduce to a great extent the intensity of emotional tension and anxiety which makes the patient more amenable to other types of therapy, including psychotherapy. The tranquilizing action of these drugs in the group of other functional-and-personality disorders produced positive changes in behavior patterns. The use of any form of physical restraints has been eliminated completely as well as sedatives; there is no need or indication for electric shock at the present time.

(Author's Abstr.)

JUNE

Current Pathway and Neurophysiologic Effects of Electrically Induced Convulsions. *Aird, R. B., et al.* .. 505
Mental Danger, Stress and Fear. *Meerloo, J. A. M.* .. 513
The Complex of Frustration. *Bull, N., and Strongin, E.* .. 531
Investigation of Relationships Between "Psychometric" and "Biological" Intelligence. *Reitan, R. M.* .. 536
*Studies on Mescaline. V. Electroencephalographic Evidence for the Antagonism Between Mescaline and Chlorpromazine Hydrochloride. *Merlis, S., and Denber, H. C. B.* .. 542
Goals of Short-Term Group Psychotherapy. *Kotkov, B.* .. 546
Promazine Hydrochloride in the Treatment of Chronic Catatonic Schizophrenics. *Mangun, C. W., and Webb, W. W.* .. 553
*Further Studies of the Psychological Effects of Frenquel and a Critical Review of Previous Reports. *Clark, L. D.* .. 557
The Effects of Cortisone on LSD-25 Intoxication in Schizophrenic Patients. *Clark, L. D., and L. S.* .. 561
Carbon Dioxide Therapy. *Frank, J. A., and McGraw, R. B.* .. 563
Mothers of Schizophrenics. *Galvin, J.* .. 568
Psychosis Following Lumbar Puncture. *Weiland, I. H., and Trosman, H.* .. 571
Detection of Phenylpyruvic Oligophrenia. *Fellman, J. H.* .. 575

Studies on Mescaline. V. Electroencephalographic Evidence for the Antagonism Between Mescaline and Chlorpromazine Hydrochloride

1. In a group of 21 epileptics the injection of chlorpromazine hydrochloride served to potentiate the abnormality of the brainwave patterns.
2. Chlorpromazine hydrochloride in 25 schizophrenic patients serves to antagonize the clinical and electroencephalographic effects of mescaline sulfate.
3. Evidence is submitted to suggest the hypothesis that chlorpromazine hydrochloride by its depressant effects on the reticular masses serves to produce an accentuation of paroxysmal and dysrhythmic activity by the removal of the inhibitory activity of the reticular substance.

(Authors' Abstr.)

Further Studies of the Psychological Effects of Frenquel and a Critical Review of Previous Reports

Treatment of schizophrenic patients with oral and intravenous Frenquel failed to confirm claims that this drug has "anti-delusional" or "anti-hallucinatory" effects on such cases. The drug was of no therapeutic value in the patients treated. Even large doses did not modify their behavior or mental symptoms in any consistent way.

A small series of patients with toxic delirium was treated with intravenous Frenquel. No evidence was obtained that the drug has predictable or consistent effects upon the hallucinations or other mental abnormalities associated with such mental disturbances.

Studies on the effects of Frenquel on LSD-25 intoxication in experimental subjects failed to confirm reports that premedication with this drug "blocks" LSD-25 intoxication or that it exerts a specific suppressive effect when given intravenously at the height of the intoxication. In self-experiments with mescaline sulfate, the author found no subjective evidence that premedication with Frenquel modifies the nature or duration of mescaline intoxication.

(Author's Abstr.)

VOL. 20 J. NEUROPHYSIOL. JANUARY, 1957

Corticifugal Influences on Intrinsic Brainstem Conduction in Cat and Monkey. *Adey, W. R., et al.* .. 1
A Servoanalytic Study of Consensual Pupil Reflex to Light. *Stark, L., and Sherman, P. M.* 17
Electric Potentials Occurring Around a Neurone During its Antidromic Activation. *Fatt, P.* .. 27
Sequence of Events in Synaptic Activation of a Motoneurone. *Fatt, P.* .. 61
Circus Movements and Excitation of Striatal and Mesodiencephalic Centers in Rabbits. *White, R. P., and Himwich, H. E.* .. 81
*Shivering as a Result of Brain Stimulation. *Birzis, L., and Hemingway, A.* .. 91
Influence of Stimulation of Some Subcortical Areas on Electrocardiogram. *Korteweg, G. C. J., et al.* .. 100
Role of Auditory Cortex in Discrimination of Changes in Frequency. *Butler, R. A., et al.* 108

Shivering as a Result of Brain Stimulation

Electrical stimulation at 21 sites in the brain stem of five cats under light barbiturate anesthesia caused tremor having the characteristics of natural shivering. The positive stimulation sites lay within the lesion-determined "shivering pathway" in the midbrain and pons. The positive hypothalamic stimulation site was located in the medial part of the tuberal hypothalamus, between the mammillothalamic tract and the fornix.

(Authors' Abstr.)

MARCH

*Studies on Amygdaloid Nucleus of Cat. *Shealy, C. N., and Peele, T. L.* 125
Activity of Anterior Suprasylvian Gyrus in Response to Transcallosal Afferent Volleys *Peacock, S. M., jr.* 140
Efferent Brain Discharge During Shivering. *Birzis, L., and Hemingway, A.* 156
Antidromic Action Potentials in Lateral Geniculate Body. *Vastola, E. F.* 167
Receptor Potential of Vertebrate Retina. *Motokawa, K., et al.* 186
*Identification of Neurones Giving Burst Response in Isolated Cerebral Cortex. *Burns, B. D., et al.* 200

Studies on Amygdaloid Nucleus of Cat

1. Stimulations of the amygdala in the unanesthetized cat have been carried out. The responses observed have been autonomic, somatic, and behavioral, this last combining the former two. Electrolytic destruction of the amygdala has been attempted.
2. Pupillary dilatation, salivation, increased gastric acidity and peristalsis, micturition, and defecation have been produced.
3. Ovulation, increase in uterine contractions, and initiation of labor in the pregnant cat, have been observed. Erection and ejaculation were produced in one animal.
4. Somatic activities observed have included turning of the head, facial movements, jaw movements, and tongue movements.
5. Behavioral responses elicited have been a state of alert attention, a reaction of fear, or one of undirected rage.
6. Complete circumscribed destruction of the amygdala was not obtained in any animal. Almost complete and circumscribed, bilateral destructions, however, did not result in ill-tempered animals or in hypersexed animals in any instance.
7. The amygdala has anatomical and functional relations with the hypothalamus which may or may not be the exclusive channel for the expression of amygdala effects. Specific, isolated functional localizations in the amygdala probably do not exist. Patterns of behavioral activity are probably co-ordinated in the amygdala.

(Authors' Abstr.)

Identification of Neurones Giving Burst Response in Isolated Cerebral Cortex

1. An attempt has been made to identify histologically type-B cells (7) of the cat's neurologically isolated cerebral cortex.
2. Cells were detected with the tip of a metal microelectrode pushed slowly through the cortical grey matter, and type-B cells were located by physiological tests.
3. Marks for histological identification were then made in the vicinity of these cells.
4. The results show that the largest type-B cells have their somata in layer V although there are some cells of this type throughout layers II, III, IV and the upper part of VI.
5. The somata of type-B cells are among the largest cell bodies in any layer.
6. Although the connections of the primary type-B cell network appear to lie in layers IV and V, the largest pyramidal cells of layer V are not part of this primary network. Their main function apparently is to convey excitation received from the primary type-B cells out of the cortex.

(Authors' Abstr.)

VOL. 20 J. NEUR. NEUROSURG. PSYCHIAT. FEBRUARY, 1957

Abnormal Immunological Reactions in Disseminated Sclerosis. *Smith, H. V., et al.* .. 1
Loss of Recent Memory after Bilateral Hippocampal Lesions. *Scoville, W. B., and Milner, B.* 11
The Recurrence of Intracranial Meningiomas after Surgical Treatment. *Simpson, D.* 22
A Variety of Paramyotonia Congenita. *French, E. B., and Kilpatrick, R.* 40
A Simplified Neurosurgical Technique for Approaching and Damaging the Region of the Globus Pallidus in Parkinson's Disease. *Obrador, S.* 47
An Unusual Form of Widespread Vascular Disease of the Brain in a Youth. *Treip, C. S., and Porter, R. J.* 50
Some Relationships Between Peripheral Vasomotor and EEG Changes. *Ackner, B., and Pampiglione, G.* 58
Conduct Disorders in Epileptic Children. *Grunberg, F., and Pond, D. A.* 65

VOL. 16 **J. NEUROPATH. EX. NEUR.** JANUARY, 1957

Editorial—Neuropathology in Western Europe. *Weil, A.* 1
X-ray Induced Pyknosis of Cerebellar Granule Cells in Guinea Pigs and Its Suppression by Barbiturate Anesthesia. *Alvord, E. C., jr., and Brace, K. C.* 3
Neurological Structure and Relationships as Revealed by Electron Microscopy. *Farquhar, M. G., and Hartmann, J. F.* 18
Histochemical Studies on Brain Glycogen of the Guinea Pig and Its Alteration Following Electric Shock. *Shimizu, N., and Kubo, Z.* 40
Histogenesis of Compound Granular Corpuscles in the Mouse Brain After Trauma and a Note on the Influence of Cortisone. *Field, E. J.* 48
The Induction of Exacerbations of Allergic Meningoencephalomyelitis. *Bogdanove, L. H., and Clark, G.* 57
Diffuse-Disseminated Sclerosis in the Adult. *Poser, C. M.* 61
Tremor on Stimulation of the Midbrain Tegmentum After Degeneration of the Brachium Conjunctivum. *Wycis, H. T., et al.* 79
Transplantation of a Canine Thyroid Carcinoma to the Central Nervous System of Heterogeneous Puppies. *Allam, M. W., et al.* 85
Carcinomatosis of the Central Nervous System Presumably Arisen from the Prostate. *Reske-Nielsen, E.* 89
The Relative Participation of Flexor and Extensor Muscles in Decerebrate Extensor Spasms. *Hagamen, W. D., and Beals, R. L.* 95
Alterations in Cell Structure Following Sudden Increase in Intracranial Pressure. *Chason, J. L., et al.* 102

VOL. 43 **J. PSYCHOL.** JANUARY, 1957

Symbolic Mediation and Organization of Thought: An Experimental Approach by Means of the Line Schematization Technique. *Werner, H., and Kaplan, B.* .. 3
Behavior in a Free Choice Multiple Path Elimination Problem. *Lachman, S. J., and Brown, C. R.* 27
Differentiation Between Introvert-Extravert Types by Rorschach Method as Compared With Other Methods. *Wysocki, B. A.* 41
Vitamin Deficiencies in Mental Illness. *Watson, G.* 47
Emotional Associations With Air and Rail Transportation. *Bennett, E. M., et al.* .. 65
Two Methods for Generating Matrices of Forms of Graded Similarity. *LaBerge, D. L., and Lawrence, D. H.* 77
Lethal Interaction of Chlorpromazine and Electroconvulsive Shock. *Brown, W. L., et al.* 101
The Young East German and Soviet Defector: A Report on Similarities. *London, I. D.* 103
Audiogenic Seizures and the *a/jax* Mouse. *Vicari, E. M.* 111
Contributions to a Learning Theory Account of Childhood Autism. *Philips, E. L.* .. 117
A Further Test of the Role of Drive Reduction in Human Cardiac Conditioning. *Zeaman, D., and Wegner, N.* 125
Efficient Retention and Transfer as Affected by Learning Method. *Forgus, R. H., and Schwartz, R. J.* 135
A Methodological Discussion of Nonverbal Behavior. *Ekman, P.* 141
A Normative Study of the Edwards' Personal Preference Schedule. *Allen, R. M., and Dallek, J. I.* 151
The Effect of Repetition Upon the Enjoyment of Modern Music. *Mull, H. K.* 155

VOL. 2 **J. PSYCHOM. RES.** MARCH, 1957

A Study of Intestinal Repercussions of Emotion by Means of Sigmoidography. *Quarti, C., et al.* 1
Somatotypes and Psychosomatic Diseases. *Bronwer, D.* 23
Peptic Ulcer and Alcoholism. *Hagnell, O., and Wretmark, G.* 35
Clinical Psychiatric Studies Using the Sedation Threshold. *Shagass, C., et al.* .. 45
The Influence of Stress on Mammary Cancer in Mice. *Reznikoff, M., and Martin, D. E.* 56
The Menstrual Cycle and its Disorders in Psychiatric Patients. *Gregory, B. A. J. C.* .. 61

VOL. 45 **J. SOC. PSYCHOL.** FEBRUARY, 1957

Complementary Theories of Safety Psychology. *Kerr, W.* 3
A Variational Approach to Empathy. *Luchins, A. S.* 11
Theoretical Implications for a Psychology of the Ludicrous. *Lucile, S. A., and Ballmann, C.* 19
Some Variables in Buzz Sessions. *Vinacke, W. E.* 25
Brothers Under the Skin: A Validity Test of the *F*-Scale. *Wells, W. D., et al.* 35
The "Source" Dimension of Second-Hand Evidence. *Dinnerstein, D.* 41
The Effect of Intelligence and Social Atmosphere on Group Problem Solving Behavior. *Calvin, A. D., et al.* 61
The Validity of Clinical Judgment: Predicting Success and Failure of Criminals on Parole. *Miles, D. W.* 75
Consistency Test of Psychic Tension Ratings Involved in Consumer Purchasing Behavior. *Bilkey, W. J.* 81

Delegate Communication as an Index of Group Tension. *Grace, H. A., and Tandy, M. J.* 93
A Scale to Measure World-Minded Attitudes. *Sampson, D. L., and Smith, H. P.* .. 99
Authoritarianism and Attitudes Toward Children. *Gallagher, J. J.* 107
Reliability, Validity, and Stability of a Sociometric Rating Scale. *Davis, J. A., and Warnath, C. F.* 111

VOL. 22 J. SPEECH HEAR. DIS. MARCH, 1957

Effects of Time Compression Upon the Comprehension of Connected Speech. *Fairbanks, G., et al.* 10
Auditory Comprehension of Repeated High-Speed Messages. *Fairbanks, G., et al.* .. 20
Auditory Comprehension in Relation to Listening Rate and Selective Verbal Redundancy. *Fairbanks, G., et al.* 23
Obsessive-Compulsive Reactions in Stutterers. *Bloodstein, O., and Schreiber, L. R.* .. 33
Stutterers' and Non-Stutterers' Reactions to Speech Situations. *Trotter, W. D., and Bergmann, M. F.* 40
Effect of Speech on Metabolism: A Comparison Between Stutterers and Non-Stutterers. *McCroskey, R. L., jr.* 46
Social and Emotional Aspects of Aphasia. *Biorn-Hansen, V.* 53
Hearing Loss in Aphasia. *Street, B. S.* 60
Home Teaching of Young Deaf Children: A Pointer in Parent Education. *Bennett, D. M. N.* 68
Survey of Families Enrolled in the John Tracy Clinic Correspondence Course. *Lowell, E. L., et al.* 75
Recognition of Intelligibility Test Materials. *O'Neill, J. J.* 87
Recruitment in Ears With Abrupt Loss of Acuity for High Frequencies. *Hedgecock, L. D.* 91
Analysis of Speech Defects Among the Institutionalized Mentally Retarded. *Schlanger, B. B., and Gottsleben, R. H.* 98
Graduate Theses in Speech and Hearing Disorders—1955. *Knower, F. H.* 104

VOL. 7 NEUROL. JANUARY, 1957

"Psychomotor" or "Temporal Lobe" Epilepsy. *de Jong, R. N.* 1
*Face and Jaw Movements During Epileptiform Discharge in Temporal Regions. *Baldwin, M., et al.* 15
*Laughter in Epilepsy. *Druckman, R., and Chao, D.* 26
Palatal Myoclonus. *Hermann, C., et al.* 37
Further Observations on Craniovascular Studies. *Brazil, P., and Friedman, A. P.* .. 52
Cingulate Gyrus Seizures. *Andy, O. J., and Chinn, R. Mc.* 56

Face and Jaw Movements During Epileptiform Discharge in Temporal Regions

In certain primates, repetitive stimulation of one mesial temporal region is followed by ipsilateral facial movements. This intense electrical stimulation induces an after-discharge which can be recorded from the opposite mesial temporal structures. The further electrographic effects of the after-discharge can also be recorded from temporal, parietal, and frontal cortex. It can be established easily at low voltages, and once established it continues for a time. During this period consciousness is altered, the face, jaw, head, and contralateral upper extremity move, and the animal may salivate or lacrimate. Occasionally the ipsilateral grimace occurs before consciousness is altered. There is usually a concomitant tachycardia and an initial inspiratory arrest.

In certain patients, focal epileptiform activity is followed by ipsilateral facial movements. This has been observed in six cases in which the epileptogenic lesion was localized in the mesial temporal region. These ipsilateral movements occurred as initial phenomena in the habitual ictal sequence of these patients. However, facial movements which occur in the ictal progression of a temporal lobe sequence are more commonly bilateral. When the initial movements of the face are one-sided, they may occur on the same side as the significant epileptogenic lesion which lies deep within the mesial temporal region.

(Authors' Abstr.)

Laughter in Epilepsy

Eleven patients with laughter as an epileptiform manifestation have been described. The laughter varied from violent prolonged laughter lasting two minutes or so to giggling and even grinning. The epileptic origin of the laughter was indicated by the lack of any external precipitant, by the nature of the laughter, by concomitant manifestations of epilepsy, and by response to anticonvulsant medication. The clinical and the electroencephalographic picture of these patients showed much variation, but in general indicated the probability of an organic lesion of the brain as the causative factor. The possible role of the hypothalamus in the production of this seizure manifestation has been discussed.

(Authors' Abstr.)

FEBRUARY

*Neurologic Guides to Prognosis in Asphyxia and Anoxia. *Tarlov, I. M., and Brace, D.*	75
Spontaneous Subarachnoid Hemorrhage. *Rowley, J. F., et al.*	86
Determination of Retinal Artery Pressures in Diagnosis of Carotid Artery Occlusion. *Heyman, A., et al.*	97
Seizure States and Pregnancy. *Suter, C., and Klingman, W. O.*	105
Effect of Diamox on C.S.F. Pressure of Cat and Monkey. *Knopp, L. M., et al.*	119
Collateral Regeneration from Residual Motor Nerve Fibres in Amyotrophic Lateral Sclerosis. *Wohlfart, G.*	124

Neurologic Guides to Prognosis in Asphyxia and Anoxia

Neurologic examination of patients who have suffered from respiratory arrest or obstruction occurring during or immediately after operation may provide important clues to prognosis. The authors' own experience with such cases has led to the following conclusions, which would appear to apply to patients suffering from cardiac arrest or anoxia from other causes.

1. The occurrence of fixed and dilated pupils and generalized extensor rigidity indicates a severe irrecoverable degree of neuronal damage at the brainstem level, and is, in the authors' experience, incompatible with survival. The appearance of either fixed and dilated pupils or marked generalized extensor rigidity alone is of very grave prognostic significance. Such patients may survive, but serious sequelae may appear.

2. Delayed awakening from anesthesia or asphyxia without abnormal neurologic signs other than mental confusion or impaired memory indicate mild reversible damage at a superficial cortical level and full recovery may be expected.

3. Prognosis is less certain in the intermediate group of patients who show abnormal motor or sensory signs. Survival usually occurs in these patients, and, although there may be recovery which may continue for months, serious sequelae, such as impaired mentality or vision, ataxia, motor or sensory abnormalities, may persist. However. coma that is prolonged more than two or three days is of very serious significance and is often followed by death or serious neurologic after-effects.

(Authors' Abstr.)

VOL. 30 PSYCHIAT. QUART. OCTOBER, 1956

Sigmund Freud: 1856–1956. *Braceland, F. J.*	561
Reactions to Untimely Death. *Lehrman, S. R.*	564
Psychotherapeutic Evolution and Its Implications. *Kolb, L. C.*	579
Yurok Shell Money and "Pains": A Freudian Interpretation. *Posinsky, S. H.*	598
*Preliminary Evaluation of a New Phenothiazine Derivative—NP207. *Malitz, S., and Hoch, P. H.*	633
*The Management of Side Effects of Chlorpromazine and Reserpine. *Sainz, A. A.*	647
Intent. *Mettler, F. A.*	654
Resistance to Lysergic Acid in Schizophrenic Patients. *Cline, H. S., and Freeman, H.*	676
Community Responsibility for Mental Health in Britain, the Netherlands, and New York State. *Hunt, R. C.*	684

Preliminary Evaluation of a New Phenothiazine Derivative—NP207

1. NP207 appears to have definite beneficial effects in the reduction of tension. It seems to diminish anxiety with fewer side effects than chlorpromazine.

2. Although an insufficient number of patients received both drugs to make a direct comparison, it is the writers' impression that chlorpromazine in equivalent doses is somewhat more effective in reducing anxiety and tension than NP207.

3. NP207 and BOL 148 combined did not show a superior action in the reduction of tension over NP207 alone. Higher doses and a larger series with a different patient group might give better results however.

4. Because of the development with this drug of symptoms resembling retinitis pigmentosa, further research should be undertaken only with extreme caution.

(Authors' Abstr.)

The Management of Side Effects of Chlorpromazine and Reserpine

In the writer's experience, a great number of patients fail to show improvement with either chlorpromazine or reserpine because the dosage is insufficient, or too little is given when side effects appear, or therapy is discontinued because of the side effects. About 50 per cent of such patients can receive proper dosages when the side effects are counterbalanced symptomatically; and such patients have shown marked improvement or have recovered. It is strongly, felt, therefore, that great attention should be placed on the neutralization or palliation of side effects, through ancillary medication and nursing techniques—rather than abandon therapy or reduce dosage below therapeutic levels. This is particularly in view of the fact that—save in few and far-between instances—the side effects are merely bothersome, not injurious, and severe complications are few.

It is recognized that side effects cannot be overcome in every instance. Yet the writer's experience has shown that in general they can be mitigated, at least to the point of making them bearable. By this means, more patients may expect relief from their psychiatric problems and the drugs may be used more effectively and economically. The implications of this are of extraordinary importance, not only for intramurally-treated patients, but for those undergoing ambulatory and outpatient treatment.

No attempt has been made here to cover all the known side effects of the tranquillizing drugs, but the more general or significant ones have been described and their handling outlined. Other solutions of these problems are, of course, possible and conceivable, and depend only on the ingenuity exercised by the individual physician. The dosages given are only illustrative, both those of the drugs and of the corrective medication. It must be emphasized that dosage depends principally on the individual response and not on the medication *per se*.

(Author's Abstr.)

VOL. 19 **PSYCHOSOM. MED.** JANUARY–FEBRUARY, 1957

Etiology of Duodenal Ulcer. I. Relation of Specific Psychological Characteristics to Rate of Gastric Secretion (Serum Pepsinogen). *Weiner, H., et al.* 1
The Psychology of Bodily Feelings in Schizophrenia. *Szasz, T. S.* 11
Pain, Fear, and Anger in Hypertensives and Normotensives: A Psychophysiological Study. *Schachter, J.* 17
Bullosis Psychogenica and Epidermolysis Bullosa. *Musaph, H., et al.* 30
Hyperkinetic Impulse Disorder in Children's Behavior Problems. *Laufer, M. W., et al.* 38
Assessment of Significant Role Attitudes in Primiparous Mothers by Means of a Modification of the TAT. *Lakin, M.* 50
The Etiology of Experimental Gastric Ulceration. *Weisz, J. D.* 61

VOL. 17 **QUART. J. STUD. ALC.** DECEMBER, 1956

The Jellinek Alcoholism Estimation Formula and Its Application to Canadian Data. *Popham, R. E.* 559
*Anesthesia. *LIII.* Effect of Alcohols and Acetaldehyde on Oxidative Phosphorylation in Brain. *Truitt, E. B., jr., et al.* 594
Polyneuropathy as a Complication of Disulfiram Therapy of Alcoholism. *Hayman, M., and Wilkins, P. A.* 601
Psychological Observations in a Group of Alcoholic Patients. With Analysis of Rorschach, Wechsler-Bellevue and Bender-Gestalt Test Results. *Kaldegg, A.* .. 608
Choice of Alcoholic Beverage Among 500 Alcoholics in Brazil. *Parreiras, D., et al.* .. 629
A Follow-up Study of 221 Alcohol Addicts in Denmark. *Norvig, J., and Nielsen, B.* 633
Some Antecedent Factors in the Family Histories of 109 Alcoholics. *Wahl, C. W.* .. 643
Group Therapy of Alcoholics with Concurrent Group Meetings of Their Wives. *Gliedman, L. H., et al.* 655
The Genesis and Development of Alcoholism: An Empirically Based Schema. *Button, A. D.* 671

Anesthesia. LIII. Effect of Alcohols and Acetaldehyde on Oxidative Phosphorylation in Brain

1. Alcohol and its homologues up to *n*-butanol do not uncouple oxidative phosphorylation from respiration at concentrations producing acute intoxication or narcotic activity *in vivo*.
2. A limited uncoupling action was observed for *n*-pentanol in high concentration.
3. Tribromoethanol solution is another anesthetic alcohol not eliciting significant uncoupling activity.
4. These results are interpreted as further evidence against the uncoupling of oxidative phosphorylation from respiration as a common mechanism of action of anesthetic and hypnotic agents.
5. Acetaldehyde produces a limited degree of uncoupling, but does so in concentrations approximating those occurring *in vivo* both normally and following the disulfiram-alcohol reaction.
6. The implications of these findings for the mechanism of the neuropharmacologic actions of alcohol and acetaldehyde are discussed.

(Authors' Abstr.)

VOL. 18 MARCH, 1957

Effects of Alcoholic Beverages on Skin Conductance. An Exploratory Study. *Carpenter, J. A.* 1
Individual Differences in Behavior and Alcohol Consumption in the Rat. *Tobach, E.* 19
The Effect of Alcohol on Urethritis. *Tyler, D. E.* 30
A Study of the Process of Affiliation with Alcoholics Anonymous. *Trice, H. M.* .. 39
Drinking Among Andean Indians. *Mangin, W.* 55
Characteristics of Male Alcoholics Admitted to the Medical Ward of a General Hospital. *Falkey, D. B., and Schneyer, S.* 67
A Follow-Up of Alcoholics Committed to a State Hospital. *Selzer, M. L., and Holloway, W. H.* 98
Ego Religion and Superego Religion in Alcoholics. *Sessions, P. M.* 121

VOL. 9 QUART. J. EX. PSYCHOL. FEBRUARY, 1957

Immediate Memory and Simultaneous Stimuli. *Broadbent, D. E.*	1
A Stochastic Description of the Learning Behaviour of an Individual Subject. *Audley, R. J.*	12
The Effect of Interpolated Experience on Visual Recognition. *Hunter, I. M. L., and Duthie, J. H.*	21
Sensory Factors in the Voluntary Application of Pressure. *Provins, K. A.*	28
The Error Power Spectrum as a Technique for Assessing the Performance of the Human Operator in a Simple Task. *Sutton, G. G.*	42
The Effect Upon Monaural Sensitivity of Continuous Stimulation of the Opposite Ear. *Ingham, J. G.*	52

VOL. 1 RASS. PSICOL. GEN. CLIN. 1956

The Emperical Factor in Perception. *Kanizsa, G.*	9
A Case of Misbehaviour in a Child. *Kos, M., et al.*	16
A Methodological Contribution to the Evaluation of Projective Tests. *De Grada, F.*	48
Results of the Application of the "Mosaic" Test of Gille to the School-boy Population of Palermo. *Riccobono, L., and Morante, L.*	73
Reward and Punishment in the Process of Learning. *Cattanaro, E.*	101

VOL. 45 RASS. STUDI. PSICHIAT. 1956

Aseptic Meningitis in Diabetes Mellitus. *von Elste, E. R.*	205
The Problem of Federn's Theory of Schizophrenia. *Sagripanti, P.*	211
On the Problem of Blame. *Declich, M.*	227
Studies on the Microincineration of Blood. *Tronconi, V., and Romerio, C.*	239
Hyperpyretotherapy According to Buscaino and Acetylcholine Therapy According to Fiamberti in the Treatment of Chronic Schizophrenia. *Pappatardo, P., et al.*	245
A Contribution to Knowledge of Winiwarter-Buerger Disease. *Carmi, G., and Ciampolini, E.*	271
The Relation Between Psychopathy and Psychosis. *De Reuzi, E.*	297
Modifications of the Menstrual Cycle by E.C.T. *Giannini, A., and Del Carlo Giannini, G.*	326
The "Image Reaction" in Obsessive-Compulsive Psychoneurotics. Examined by the Word Association Test. *Basaglia, F., and Pessina, G.*	344
Pre- and Post-operative Psychometric Comparative Results in Cases of Transorbital Leucotomy. *Fabbri, W.*	415
The Curious Language of a Manic Patient. *Gamna, G., and Gandiglio, G.*	464
The Verbal Association Test and the Wechsler-Bellevue Test in a Group of Hysterics. *Basaglia, F., and Pessina, G.*	475
Primitive Neuroxitis of Probable Viral Origin. *Papalia, A.*	499
Psychosurgery in General and Particularly Fiamberti's Transorbital Prefrontal Leucotomy. *Centeleghe, E.*	552
Some Considerations on Psychopathological Problems of Self-castration. *Declich, M.*	603
Some Considerations on Induced Psychoses. *Fiore, C.*	622
The Denial of Illness Syndrome in Organic Hemiplegia. *Barontini, F.*	636
The Cyto-hormonal Examination of Psychopathic Women with Erotic Manifestations. *Leoni, G.*	699
A Contribution to the Study of Alternately Recurring Facial Paralysis. *Ferrari, E.*	730
The Constellation in Schizophrenia. *Miglio, G., and Pelyzari, G.*	737
A Case of Wilson's Disease of Abdominal Type. *Minniti, G.*	756
Schizophrenia and Regression. *Sagripanti, P.*	762
Eighth Reunion of the Italian Society of Neurology, 1956.	863–1183
The Limits of the Electrophoretic Paper Method of Examining Blood Serum and C.S.F. in Nervous and Mental Diseases. *Sarteschi, P., and Fabiani, P.*	1193
A Contribution to the Study of Vigilance. *Zanocco, G., and Alvisi, C.*	1229
Cochleo-vestibular Examination in Encephalitic Parkinsonism. *Barontini, F., and Cannizzaro, C.*	1250
A Clinical Contribution to the Study of the Relation Between Protopathic and Myelogenous Myopathy. *Ferrari, E., and Selva, G.*	1258
A Case of Hypophysial Adenocarcinoma with Mediastinal Metastases. *Mannironi, G.*	1271
The Cytochemical Examination of the C.S.F. in Viral Inflammations of the Neuraxis. *Buscaino, G. A.*	1288
The Neurological Complication of Diphtheria. *Barontini, F.*	1319
Two Cases of Paranoia. *Carrai, E.*	1333
Some Conclusions from the Clinical Practice of Psychopathology. *Zitocchi, A.*	1349
The Action of "Diamox" on the Clinical Picture and Electrolyte Behaviour in Epileptics. *Ronco, P., and Lenti, C.*	1354
The Treatment of Epilepsy with Mysoline. *Balestrieri, A.*	1365
The Use of Gangioplegics in High Dosage in Neuropsychiatry. *Manganzani, L.*	1375

VOL. 4 REV. ALCOOL. 1956

Symposium on the Ambulatory Treatment of Alcoholism	93

VOL. 94 REV. NEUROL. JUNE, 1956

The Organisation of the Normal and Pathological EEG. *Lairy, G. C.*	749
EEG and Ancillary Sciences—Papers read at the Meeting in Paris, 28–29 May, 1956	804–904

VOL. 95 JULY 1956

The Respiratory Form of Acute Porphyria. *Bonduelle, M., and Mollaret, P.*	3
Nodular Encephalitis of Subacute Type Associated with Anatomoclinical Signs of Polyneuritis. *Alajouanine, T., et al.*	20
A Congenital Mutilating Osteopathy Associated with an Apparent Affection of Atrophic Acrodermatitis. *Eyckmans, R., et al.*	37
On a Congenital Pigmentary Syndrome. *Dockx, L., et al.*	48

AUGUST

Considerations on Intracranial Metastases After 107 Cases Verified Histologically. *Petit-Dutaillis, D., et al.*	89
Remarks on a New Observation of Acute Necrosing Encephalitis with Inclusions. *Recordier, M., et al.*	116
Absence of Senile Plaques and Angioarchitectomic Conditions in the Allocortical Cerebral Cortex HD of Von Economo. *Wildi, E., and Gregoretti, L.*	137
Familial Tetanus and the Pseudo-parathyroid Syndrome of Albright. *Behague, P., and Soulas, B.*	150
Some Factors Supporting the Allergic Conception of Multiple Sclerosis and of Certain Cases of Myelitis. *Patrikios, J. S.*	162

SEPTEMBER

Schilder's Disease and Subacute Sclerosing Leucoencephalitis. *van Bogaert, L., et al.*	185
A Contribution to the Study of Cicatricial Areas of Elective Parenchymatus Necrosis in the Occipital and Prefrontal Cortex. *Gregoretti, L.*	207
Circulatory Repercussions of Experimental Epilepsy in the Dog. *Benelli, C., et al.*	218
Familial Forms of Amyotrophic Lateral Sclerosis. *Boudin, G., and Barbizet, J.*	229
Acute Haemorrhagic Encephalitis. *Posthumus Meyjis, F. E.*	246

OCTOBER

Prevention of Accidents After Intervention on the Bulbar Region. *Tardieu, C., et al.*	284
Myoclonic Cerebellar Dyssynergia of Ramsay Hunt. *Christophe, J., and Gruner, J.*	297
A Special Form of Syringomyelia. *Osetowska-Wieckowska, E.*	310

NOVEMBER

Quadriplegia, Hypoalkemia and Hyperchloremic Acidosis after Bilateral Ureterosigmoidostomy. *Mollaret, P., et al.*	345
Panencephalitis with Extensive Necrosis of the White Matter. *Alajouanine, T., et al.*	357

VOL. 77 RIV. PAT. NERV. MENT. 1956

Spontaneous Intracerebral Haematoma. *Corsino, G. M., and Lugaresi, E.*	1
Subdural Hematoma. *Corsino, G. M., et al.*	8
The Histopathological Picture of the Sequelae of Post-vaccinial Encephalitis. *Terzian, H., and Pessina, G.*	21
The Parietal Syndrome. *de Risio, C.*	38
The Mechanism of E.C.T. *Giacomo, C. G.*	48
Cerebral Thrombophlebitis in the Puerperium. *de Risio, C., and Saginario, M.*	59
Adie's Syndrome. *Montanari, M., and Fratoni, A.*	71
Degenerate Chorea. *Montanari, M.*	85
Histochemical Study on 2-deoxyribonucleic Acid Contained in the Cell Fluid in Normal and Some Pathological Conditions. *Bettinazzi, N., and Biondi, L.*	207
Clinical and Technical Importance of Artificial Sleep in Psychiatry. *Ruju, L. and P.*	223
Preliminary Observations on the Action of Extract of *Rauwolfia Serpentina* in Excited and Anxious Mental Cases. *Palazzuoli, M.*	251
Statistical Study of Alcoholism in Some Italian Provinces. *Imberciadori, E., and Manganaro, D.*	255
A Histopathological Study of the Suprarenal in Subjects Dying during Confusion. *Chiaramonti, E., and Marabini, B.*	282
Leptospiral Meningitis. *Rovetta, P.*	311
The Problem of Malignancy in Neurinomata. *Zander, E., et al.*	323
A Contribution to Knowledge of the Cerebello-myoclono-epileptic Syndrome. *Chiaramonti, E., and Sperlazzo, R.*	345
The Histopathology of Neurofibromata. *Barontini, F.*	372
Study of Systematic Delirium by the Rorschach Test. *Ferrio, L., and Besusso, P. C.*	397

The Utility of the Rapid Histological Method for the Diagnosis During Operation of Cerebral Tumours. *Barontini, F., and Zander, E.* 406
Research on the Localisation of l-tyroxine in the Brain. *Alleva, P. M., and Marinoni, U.* 449
A Case of Diffuse Cerebral Sclerosis with Globoid Cellules. *Luthy, F., and Barontini, F.* 459
Oxidative-reductive Processes and Other Phenomena in Progressive Muscular Dystrophy. *Calvi, L. A.* 657
Fibrinolysis After Acetylcholine and Other Shock Therapies. *Fabbri, W.* 671
Polyradiculoneuritis in Cerebral Tumors. *Chiaramonti, E.* 689
Considerations on "Folie à Deux". *Piazzesi, W.* 705
EEG Reports in Postinfective Pseudo-encephalitis, etc. *Masciocchi, A.* 727
Neuro-psychiatric Sequelae of Epidemic Encephalitis. *Magri, R., and Giannelli, A.* 737
An Anatomo-clinical Study of a Case of Cerebral Actinomycosis. *Pietra, G., et al.* 749
Diabetes Insipidus of Traumatic Origin. *Luzzatto, A., and Zambianchi, A.* 759
Senile Plaques-Staining by a New Method. *Schiffer, D.* 784
Reflex Epileptic Crises. *Turinese, A.* 788
Cavernous Cerebral Angioma. *Barontini, F.* 831
A Case of Senile Paranoia. *Saraval, A.* 843
The Histopathology of the Guillain-Barré-Strohl Syndrome. *Barontini, F.* 869
The Anatomic Basis of the Thalamic System and its Diffuse Projection. *Macchi, G., et al.* 895

INDEX TO VOLUME 103

The General Index covers original articles, reviews and the epitome.

The following names are printed in small capitals: Authors of original articles and of books reviewed. Names of authorities referred to in the text are in ordinary type.

(R.) indicates a *Review*; the title of the book reviewed is followed by the author's name.

(E.) indicates the *Epitome* section; the title of the epitome is followed by the author's name.

The names of authors referred to in the Epitome are listed in Part II.

PART I.—GENERAL INDEX

Acetazolamide, control of petit mal by, by F. L. Golla and R. Sessions Hodge, 214
Acetylcholine and serotonin in the spinal fluid. Sachs, E., jun. (E.), 687
Adrenal cortical function in anxious human subjects. Persky, H., *et al.* (E.), 425
Adrenaline metabolism, studies of the role of ceruloplasmin and albumin in. Leach, B. E., *et al.* (E.), 683
Agnew, N., and Fischer, R., A hierarchy of stressors, 858
Aiba, S., and Eysenck, H. J., Drugs and personality, V, 661
Aim and method in treatment, by W. Sargant, 699
Alpha rhythm, the relationships between some aspects of visual imagery and the, by C. G. Costello and P. McGregor, 786
Amphetamine and ritalin, effects of, on normal and leucotomized monkeys, by J. Cole and P. Glees, 406
Amygdaloid nucleus of cat, studies on. Shealy, C. N., and Peele, T. L. (E.), 885
,, seizure discharge, the pattern of conduction of. Gloor, P. (E.), 868
Anesthesia. *LIII.* Truitt, E. B., jr., *et al.* (E.), 889
Annett, J., The information capacity of young mental defectives in an assembly task, 621
Anthony, E. J., and Bene, E., A technique for the objective assessment of the child's family relationships, 541
Arfonad, the use of, for the alleviation of cardiovascular stress following E.C.T., by G. I. Tewfik and B. G. Wells, 636
Armstrong, R. W., Education in Psychiatry; the Presidential Address, 691
Asphyxia and anoxia, neurologic guides to prognosis in. Tarlov, I. M., and Brace, D. (E.), 888
Ataractic drugs, the. Bones, H. A. (E.), 682
Atarax, a clinical trial with hydroxyzine on a group of maladjusted subnormal children, by L. J. Segal and A. E. Tansley, 677
Auditory cortex, role of, in discrimination requiring localization of sound in space. Neff, W. D., *et al.* (E.), 686

Bantu schizophrenics, evaluation of a common method of convulsion therapy in, by J. S. du T. De Wet, 739
Basal ganglia, the incidence, composition and pathological significance of intracerebral vascular deposits in the. Slager, U. T., and Wagner, J. A. (E.), 436
Batt, J. C., *et al.*, The endocrine concomitants of schizophrenia, 240
Behavioral changes during intracerebral electrical stimulation. Higgins, J. W., *et al.* (E.), 424
Bender Gestalt Test, an enquiry into the determinants of a differentiation between elderly, "organic" and "non-organic" psychiatric patients on the, by M. B. Shapiro, *et al.*, 364
Bene, E., and Anthony, E. J., A technique for the objective assessment of the child's family relationships, 541
Benians, R. C., and Hunter, R. A., Megaloblastic anaemia occurring during treatment of epilepsy with phenytoin sodium, primidone and phenobarbitone, 606
Berserk, on going. Fabing, H. D. (E.), 422
Bhargava, S. P., and Gour, K. N., Biochemical studies in electric convulsive therapy, 257
Birth-injury, vascular mechanisms of. Norman, R. M., *et al.* (E.), 872
Black, D. A., *et al.*, Meprobamate in the treatment of tension states, 581
Bockner, S., A controlled clinical trial of methylpentynol ("Oblivon"), 218
Brain changes in electroshock therapy. Madow, L. (E.), 422
,, copper-protein fractions in the normal and in Wilson's disease. Porter, H., and Folch, J. (E.), 866
,, damage, critique of psychological approaches to, by V. Meyer, 80
,, ,, effects of centrally acting drugs on two tests of. Primac, D. W., *et al.* (E.), 869
,, differential growth of the human. Noback, C. R., and Moss, M. L. (E.), 879

Brain injury, studies of cerebral circulation in, IV. Meyer, J. S. (E.), 875
,, stimulation, shivering as a result of. Birzis, L., and Hemingway, A. (E.), 884
Brandon, M. W. G., The intellectual and social status of children of mental defectives. I and II, 710, 725
Brown, E. L., and Greenblatt, M., From custodial to therapeutic patient care in mental hospitals, review by D. C. Watt (R.), 418
Burbury, W. M., The use of children's drawings in clinical diagnosis, 487

Cahal, D. A., Some effects of nalorphine on the behaviour of healthy human volunteers, 850
Calcium metabolism in E.C.T., a study of, by H. M. Chaudhry and K. N. Gour, 275
Callbeck, M. J., and Hoffer, A., The hypocholesterolemic effect of nicotinic acid and its relationship to the autonomic nervous system, 810
Casey, S., *et al.*, Drugs and personality. II, 645
Centrally acting drugs in man, comparison of psychological effects of certain. Kornetsky, C., *et al.*, (E.), 869
,, ,, ,, and personality, relationships between effects of a number of. Kornetsky, C., and Humphries, O. (E.), 869
Cerebral cortex, identification of neurones giving burst response in isolated. Burns, B. D., *et al.* (E.), 885
,, ,, somatic afferent areas I and II of dog's, Hamny, T. P., *et al.* (E.), 686
,, lesions, ability to discover hidden figures after. Teuber, H.-L., and Weinstein, S. (E.), 424
Chaudhry, H. M., and Gour, K. N., Study of calcium metabolism in E.C.T. in certain mental diseases, 275
Children's drawings, the use of, in clinical diagnosis, by W. M. Burbury, 487
Children, epileptic, abilities and behaviour of, by H. Halstead, 28
,, maladjusted subnormal, clinical trial with hydroxyzine (atarax) on, by L. J. Segal and A. E. Tansley, 677
,, of mental defectives, intellectual and social status of, by M. W. G. Brandon, 710, 725
Child's family relationships, technique for the objective assessment of the, by E. J. Anthony and E. Bene, 541
Chronic patients in a mental hospital, a survey of, by K. W. Cross, *et al.*, 146
Chlorpromazine treatment of disturbed epileptic patients. Bonafede, V. I. (E.), 868
,, effects of, on chronic lobotomized schizophrenic patients. Freeman, H., and Cline, H. S. (E.), 425
,, in clinical research and practice, a two-year evaluation of. Malitz, *et al.* (E.), 682
,, and hepatic function. Kinross-Wright, V., and Moyer, J. H. (E.), 683
,, some observations on the minimal effective dosage of. Kehoe, M. J., and Pollard, J. C. (E.), 434
,, the use of, in psychotherapy. Newbold, H. L., and Steed, W. D. (E.), 434
,, and reserpine. Fraser, H. F., and Isbell, H. (E.), 423
,, ,, ,, in residential treatment of neuropsychiatric disorders in children. Miksztal, M. W. (E.). 883
,, ,, ,, the management of side effects of. Sainz, A. A. (E.), 888
,, ,, ,, combined treatment with, by K. E. Schmidt, 200
Cingulectomy, vivid day-dreaming, an unusual form of confusion following. Whitty, C. W. M., and Lewin, W. (E.), 872
Cole, J., and Glees, P., Some effects of ritalin and amphetamine on normal and leucotomized monkeys, 406
Communist interrogation and indoctrination of "Enemies of the State". Hinkle, L. E., and Hoeff, H. G. (E.), 290
Conceptual aspects of object sorting, differences between schizophrenic and brain-damaged groups in. McGaughran, L. S., and Moran, L. J. (E.), 877
Conflict avoidance in obsessionals and hysterics, by V. Hamilton, 666
Cortex of the Island of Reil in the brain of the monkey, some results obtained by electrical stimulation of the. Frontera, J. G. (E.), 879
Cortical brain impairment, diagnostic testing for. Garrett, E. S., *et al.*, (E.), 867
Cortico-spinal system, the relation between electro-cortical waves and responsiveness of the. Brookhart, J. M. and Zanchetti, A. (E.), 293
Costello, C. G., The control of visual imagery in mental disorder, 840
,, and McGregor, P., The relationships between some aspects of visual imagery and the alpha rhythm, 786
Couper, L., *et al.*, The efficacy of parentrovite in the treatment of a group of senile psychotics 601
Craft, M., Tranquillizers in mental deficiency, 855
Criminals: recidivist prisoners, MMPI in, by J. K. W. Morrice, 632
,, the sexual behaviour of young, by T. C. N. Gibbens, 527
Cross, K. W., *et al.*, A survey of chronic patients in a mental hospital, 146

Delirium with low serum sodium. Welti, W. (E.), 425
Delinquent girls, an investigation into some of the effects of early separation from the mother on, by E. O'Kelly, 381
De Wet, J. S. Du T., Evaluation of a common method of convulsion therapy in Bantu schizophrenics, 739
Disseminated sclerosis. *See* multiple sclerosis
Drugs and personality, I, by H. J. Eysenck, 119
,, ,, ,, II, by H. J. Eysenck, *et al.*, 645
,, ,, ,, III, by H. J. Eysenck, *et al.*, 650
,, ,, ,, IV, by H. J. Eysenck, *et al.*, 656
,, ,, ,, V, by H. J. Eysenck and S. Aiba, 661
Drug therapy: placebos and their psychological effects, by D. S. Trouton, 344
,, ,, use of some new pharmacological agents in psychiatry, by D. M. Leiberman and G. F. Vaughan, 110

E.C.T. in Bantu schizophrenics, evaluation of, by J. S. du T. De Wet, 739
,, biochemical studies in, by K. N. Gour and S. P. Bhargava, 257
,, in certain mental diseases, study of calcium metabolism in, by K. N. Gour and H. M. Chaudhry, 275
,, recovery time from modified and unmodified, by A. F. M. Little and A. A. Reid, 270
,, use of arfonad for the alleviation of cardiac vascular stress following, by G. I. Tewfik and B. G. Wells, 636
Education in Psychiatry, Presidential Address, by R. W. Armstrong, 691
EEG in cerebral atrophy, the. Sisson, B. D., and Ellingson, R. J. (E.), 434
,, during E.C.T. with succinylcholine. Piekenbrock, T. C., *et al* (E.), 683
,, in dementia, the. Weiner, H., and Schuster, D. B. (E.), 293
,, *See also* alpha rhythm
Electrical activity of the brain, the effects of some drugs on the. Bradley, P. B., and Elkes, J. (E.), 872
,, ,, of frontal lobes during sleep, asynchronism of. Adams, C. L. (E.), 868
Emotional stress, influence of, on the renal circulation. Blomstrand, R., and Löfgren, F. (E.), 440
Endocrine concomitants of schizophrenia, the, by J. C. Batt, W. W. Kay, M. Reiss and D. E. Sands, 240
,, treatment: 6β-hydroxy-3:5-cyclopregnan-20-one in mental states, 835
Enuresis, clinical relationship of, to sleepwalking and epilepsy. Pierce, C. M., and Lipcon, H. H. (E.), 423
Entorhinal area, the. Adey, W. R., *et al.* (E.), 427
Epilepsy: control of petit mal by acetazolamide, by F. L. Golla and R. Sessions Hodge, 214
,, laughter in. Druckman, R., and Chao, D. (E.), 887
,, the "March" of temporal lobe. Stevens, J. R. (E.), 868
,, megaloblastic anaemia occurring during treatment of, with phenytoin sodium, primidone and phenobarbitone, by R. C. Benians and R. A. Hunter, 606
,, personality changes following temporal lobectomy for, by Denis Hill, *et al.*, 18
Epileptic children, abilities and behaviour of, by H. Halstead, 28
Experimental method in clinical psychological practice, by R. W. Payne, 189
Eysenck, H. J., Drugs and personality, I, 119
,, *et al.*, Drugs and personality, II, 645
,, *et al.*, Drugs and personality, III, 650
,, *et al.*, Drugs and personality, IV, 656
,, and Aiba, S., Drugs and personality, V, 661

Family relationships, a technique for the objective assessment of the child's, by E. J. Anthony and E. Bene, 541
Field, J., *et al.*, An enquiry into the determinants of a differentiation between elderly "organic" and "non-organic" psychiatric patients on the Bender Gestalt Test, 364
Fischer, R., Factors involved in drug-produced model psychoses, II, 392
,, and Agnew, N., A hierarchy of stressors, 858
Fish, F. J., The classification of schizophrenia, 443
Folie à trois, by S. Wolff, 355
Folie à deux, by D. H. Ropschitz, 589
Folkson, A., Use of meprobamate in tension states, 860
Forrest, A. D., Indole excretion patterns during treatment with reserpine, 614
,, Some observations on Huntington's chorea, 507
Frenquel, further studies of the psychological effects of, and a critical review of previous reports. Clark, L. D. (E.), 884
,, selection of patients for treatment with. Mason Browne, N. L. (E.), 296
Frontal lobe damage and flicker fusion frequency. Medina, R. F. (E.), 866
,, lobes in conscious patients, surface and depth electrography of the. Delgado, J. M. R., and Hamlin, H. (E.), 293

Gestalt test. *See* Bender Gestalt test
Gibbens, T. C. N., The sexual behaviour of young criminals, 527
Gillie, A. K., The use of Pacatal in low-grade mental defectives, 402
Glees, P., and Cole, J., Some effects of ritalin and amphetamine on normal and leucotomized monkeys, 406
Glutathione levels in mental and physical illness. Martens, S., *et al.* (E.), 683
Golla, F. L., and Sessions Hodge, R., Control of petit mal by acetazolamide, 214
Gour, K. N., and Bhargava, S. P., Biochemical studies in electric convulsive therapy, 257
,, and Chaudhry, H. M., Study of calcium metabolism in E.C.T. in certain mental diseases, 275
Granger, G. W., Night vision and psychiatric disorders, 48
Greenblatt, M., and Brown, E. L., From custodial to therapeutic patient care in mental hospitals. Review by D. C. Watt (R.), 418
Grygier, T. G., Psychometric aspects of homo-sexuality, 514
Gwynne Jones, H., and Meyer, V., Patterns of cognitive test performance as functions of the lateral localization of cerebral abnormalities in the temporal lobe, 758
Halstead, H., Abilities and behaviour of epileptic children, 28
Hamilton, V., Conflict avoidance in obsessionals and hysterics, 666
Hardwick, S. W., *et al.*, 6β-hydroxy-3:5-cyclopregnan-20-one in mental states, 835
Hare, E. H., and Salisbury, B. J., "Ritalin" and chlorpromazine in chronic schizophrenia, 830
Harms, E., Modern psychotherapy—150 years ago, 804
Harper, J., *et al.*, Initial psychiatric illness in involutional women, 132
Harrington, J. A., *et al.*, A survey of chronic patients in a mental hospital, 146
Head injury, diffuse degeneration of the cerebral white matter in severe dementia following. Strich, S. J. (E.), 297
Hill, D., *et al.*, Personality changes following temporal lobectomy for epilepsy, 18
Heller, G. C., *et al.*, Meprobamate in the treatment of tension states, 581
Hoffer, A., and Callbeck, M. J., The hypocholesterolemic effect of nicotinic acid and its relationship to the autonomic nervous system, 810
Holland, H., *et al.*, Drugs and personality, III, 650
,, ,, Drugs and personality, IV, 656
Homosexuality, psychometric aspects of, by T. G. Grygier, 514
Hunter, R. A., and Benians, R. C., Megaloblastic anaemia occurring during treatment of epilepsy with phenytoin sodium, primidone and phenobarbitone, 606
Huntington's chorea, some observations on, by A. D. Forrest, 507
Hydroxyzine. *See* atarax
Hypoglycemic seizures in the rabbit, sites of origin of. Tokizane, T., and Sawyer, C. H. (E.), 868
Hysterics and obsessionals, conflict avoidance in, by V. Hamilton, 666

Inglis, J., An experimental study of learning and "memory function" in elderly psychiatric patients, 796
Involutional women, initial psychiatric illness in, I, by A. C. Tait, *et al.*, 132
,, ,, ,, ,, ,, ,, II, by J. E. Orme, 227
,, ,, ,, ,, ,, ,, III, by W. McAdam, *et al.*, 824

K-complex, the form, voltage distribution and physiological significance of the. Roth, M., *et al.* (E.), 293
Krawiecki, J. A., *et al.*, The efficacy of parentrovite in the treatment of a group of senile psychotics, 601

Lewis, W. H. P., and Stern, J., Serum proteins in Mongolism, 222
Leiberman, D. M., and Vaughan, G. F., The use of some new pharmacological agents in psychiatry, 110
Limbic system, circulatory and respiratory changes induced by electrical stimulation of. Anand, B. K., and Dua, S. (E.), 437
Little, A. F. M., and Reid, A. A., Recovery time from modified and unmodified E.C.T., 270
Lorr, M., and O'Connor, J. P., The relation between neurosis and psychosis, 375
Lysergic acid diethylamide (LSD-25), further studies in the therapeutic value of, in mental illness, by R. A. Sandison and J. D. A. Whitelaw, 332
,, ,, ,, studies in the effects of. Liebert, R. S., *et al.* (E.), 867
,, ,, ,, ,, ,, on. Isbell, H., *et al.* (E.), 425

Maudsley Lecture, the Thirty-first, Psychiatry and Public Health, by J. R. Rees, 314
Mayer-Gross, W., *et al.*, A survey of chronic patients in a mental hospital, 146
McAdam, W., *et al.*, Initial psychiatric illness in involutional women. III, 824
,, and Robinson, R. A., Prognosis in senile deterioration, 821
McClatchey, W. T., *et al.*, Initial psychiatric illness in involutional women, 132
McGregor, P., and Costello, C. G., The relationships between some aspects of visual imagery and the alpha rhythm, 786

"Memory function", an experimental study of learning and, in elderly psychiatric patients, by J. Inglis, 796
Mental defectives, the intellectual and social status of children of, I and II, by M. W. G. Brandon, 710 and 725
  ,, ,, use of Pacatal in low-grade, by A. K. Gillie, 402
  ,, ,, young, the information capacity of, in an assembly task, by J. Annett, 621
  ,, deficiency, tranquillizers in, by M. Craft, 855
  ,, hospital, chronic patients in a, survey of, by K. W. Cross, *et al.*, 146
  ,, Hospitals, from custodial to therapeutic patient care in, by M. Greenblatt and E. L. Brown. Review by D. C. Watt (R.), 418
  ,, states, 6β-hydroxy-3:5-cyclopregnan-20-one in, by S. W. Hardwick, *et al.*, 835
  ,, function and cerebral oxygen consumption in organic dementia. Lassen, N. A., *et al.* (E.), 867
Meprobamate in the treatment of tension states, by G. C. Heller, *et al.*, 581
  ,, use of, in tension states, by A. Folkson, 860
Mescaline, studies on, V. Merlis, S., and Denber, H. C. B. (E.), 884
  ,, the effect of, on differentiated conditional reflexes. Bridger, W. H., and Gantt, W. H. (E.), 422
  ,, LSD-25 and adrenochrome, effects of, on depth electrograms in man. Schwarz, B. E., *et al.*, (E.), 289
Methylpentynol ("Oblivon"), a controlled clinical trial of, by S. Bockner, 218
MEYER, V., Critique of psychological approaches to brain damage, 80
  ,, and GWYNNE JONES, H., Patterns of cognitive test performance as functions of the lateral localization of cerebral abnormalities in the temporal lobe, 758
MMPI in recidivist prisoners, the, by J. K. W. Morrice, 632
Model psychoses, factors involved in drug-produced, II, by R. Fischer, 392
  ,, ,, induced by LSD-25 in normals, I. Bercel, N. A., *et al.* (E.), 289
  ,, ,, ,, ,, ,, ,, ,, II. Bercel, N. A., *et al.* (E.), 289
Mongolism, serum proteins in, by J. Stern and W. H. P. Lewis, 222
MONRAD-KROHN, G. H., The third element of speech; prosody in the neuro-psychiatric clinic, 326
Moral treatment, back to, the Presidential Address, 1956, by T. P. Rees, 303
Morphine and pentobarbital, motivational determinants in modification of behaviour by. Hill, H. E., *et al.* (E.), 866
MORRICE, J. K. W., The MMPI in recidivist prisoners, 632
Mother, early separation from, effect on delinquent girls, by E. O'Kelly, 381
Multiple sclerosis, C.S.F. thrombocyte-agglutinating substance in. Persson, I. (E.), 424
  ,, ,, flicker fusion thresholds in. Parsons, O. A., and Miller, P. N. (E.), 867
  ,, ,, the significance of liver function in the formation of fibrinogen in. Persson, I. (E.), 419

Nalorphine, some effects of, on the behaviour of healthy human volunteers, by D. A. Cahal, 850
NP207—preliminary evaluation of a new phenothiazine derivative. Malitz, S., and Hoch, P. H. (E.), 888
Neurophysiological factor of psychiatric significance, a measurable. Shagass, C. (E.), 875
Neurosis and psychosis, the relation between, by M. Lorr and J. P. O'Connor, 375
Nicotinic acid, the hypocholesterolemic effect of, and its relationship to the autonomic nervous system, by A. Hoffer and M. J. Callbeck, 810
Night vision and psychiatric disorders, by G. W. Granger, 48

"Oblivon" (methylpentynol), a controlled clinical trial of, by S. Bockner, 218
Obsessionals and hysterics, conflict avoidance in, by V. Hamilton, 666
Obsessions in schizophrenia, the clinical significance of, by I. Rosen, 773
Occupational therapy, the stabilizing effect of, on chronic psychotics with a tendency to aggressive forms of behaviour, by A. A. Robin, 597
O'CONNOR, J. P., and LORR, M., The relation between neurosis and psychosis, 375
O'KELLY, E., An investigation into some of the effects of early separation from the mother on delinquent girls, 381
"Organic" and "non-organic" psychiatric patients, Bender Gestalt Test in differentiation between, by M. B. Shapiro, *et al.*, 364
ORME, J. E., Initial psychiatric illness in involutional women, II, 222
  ,, *et al.*, Initial psychiatric illness in involutional women, III, 824

Pacatal, the effects of, on chronic mental illness, by R. W. Simpson, 610
  ,, the use of, in low-grade mental defectives, by A. K. Gillie, 402
Parentrovite, the efficacy of, in the treatment of a group of senile psychotics, by J. A. Krawiecki, *et al.*, 601
PARNELL, R. W., The Rees-Eysenck body index of individual somatotypes, 209
PAYNE, R. W., Experimental method in clinical psychological practice, 189
PEARSE, J. J., *et al.*, 6β-hydroxy-3:5-cyclopregnan-20-one in mental states, 835

Perceptual errors, a further experimental study of using, as an aid to diagnosis, by D. Walton, 556

Petit mal, control of, by acetazolamide, by F. L. Golla and R. Sessions Hodge, 214

Petrow, V., *et al.*, 6β-hydroxy-3:5-cyclopregnan-20-one in mental states, 835

Pharmacological agents in psychiatry, the use of some new, by D. M. Leiberman and G. F. Vaughan, 110

Placebos and their psychological effects, by D. S. Trouton, 344

Post, F., *et al.*, An enquiry into the determinants of the differentiation between elderly "organic" and "non-organic" psychiatric patients on the Bender-Gestalt Test, 364

Prefrontal procaine injection. Myers, J. M., jr., *et al.*, (E.), 435

Presidential Address, 1956, Back to Moral Treatment, by T. P. Rees, 303
 ,, ,, 1957, Education in Psychiatry, by R. W. Armstrong, 691

Prosody in the neuro-psychiatric clinic, the third element in speech, by G. H. Monrad-Krohn, 326

Psychiatry and Public Health, the Thirty-first Maudsley Lecture, by J. R. Rees, 314

Psychogalvanic reflex responses of normal, neurotic and psychotic subjects, an experimental study of the. Eysenck, S. B. G. (E.), 439

Psychological practice, clinical, experimental method in, by R. W. Payne, 189

Psychotherapy, modern—150 years ago, by E. Harms, 804

Psychotic patients, common medical disorders rarely found in. Ehrentheil, O. F. (E.), 867

Quiactin. Feuss, C. D., and Gragg, L., jun. (E.), 874

Rauwolfia alkaloids and reserpine in the treatment of the chronic psychotic patient, by C. Elkes, 464

Red nucleus, a study of the, in the rhesus monkey. Carpenter, M. B. (E.), 685

Rees-Eysenck body index of individual somatotypes, the, by R. W. Parnell, 209

Rees, J. R., The Thirty-first Maudsley Lecture, Psychiatry and Public Health, 314

Rees, T. P., Presidential Address, 1956, Back to Moral Treatment, 303

Reid, A. A., and Little, A. F. M., Recovery time from modified and unmodified E.C.T., 270.

Reil's "Rhapsodies": modern psychotherapy 150 years ago, by E. Harms, 804

Reserpine and Rauwolfia alkaloids in the treatment of the chronic psychotic patient, by C. Elkes, 464
 ,, behavioral changes of chronic schizophrenics in response to. McDonald, R. E., *et al.* (E.), 289
 ,, in hospitalized psychotics. Arnold, A. L., and Freeman, H. (E.), 423
 ,, indole excretion patterns during treatment with, by A. D. Forrest, 614
 ,, and chlorpromazine. Fraser, H. F., and Isbell, H. (E.), 423
 ,, ,, ,, combined treatment with, by K. E. Schmidt, 200

Reticular formation, physiological evidence of localized cerebellar projections to bulbar. Gauthier, C., *et al.* (E.), 437

Ritalin and amphetamine, some effects of, on normal and leucotomized monkeys, by J. Cole and P. Glees, 406

"Ritalin" and chlorpromazine in chronic schizophrenia, by B. J. Salisbury and E. H. Hare, 830

Ritalin in the treatment of chronic schizophrenic patients. Carey, B., *et al.* (E.), 682

Robin, A. A., The stabilizing effect of occupational therapy on chronic psychotics with a tendency to aggressive forms of behaviour, 597

Robinson, R. A., and McAdam, W. Prognosis in senile deterioration, 821

Ropschitz, D. H., Folie à deux, 589

Rosen, I., The clinical significance of obsessions in schizophrenia, 773

Salisbury, B. J., and Hare, E. H., "Ritalin" and chlorpromazine in chronic schizophrenia, 830

Sandison, R. A., and Whitelaw, J. D. A., Further studies in the therapeutic value of LSD-25 in mental illness, 332

Sargant, W., Aim and method in treatment, 699

Schizophrenia, the classification of (the views of Kleist and his co-workers), by F. J. Fish, 443
 ,, the clinical significance of obsessions in, by I. Rosen, 773
 ,, the endocrine concomitants of, by J. C. Batt, *et al.*, 240
 ,, the possibility of psychosomatic involvement of the central nervous system in. Arieti, S. (E.), 435

Schizophrenic patients, size constancy in, by T. E. Weckowicz, 475

Schizophrenics, evaluation of a common method of convulsion therapy in Bantu, by J. S. du T. De Wet, 739
 ,, and other psychotic patients, investigations on the glyoxylic acid reactions on urines from. Riegelhaupt, L. M. (E.), 435
 ,, the influence of rhythmic drumbeat stimuli upon the pulse rate and general activity of long-term, by L. Shatin, 172
 ,, a short scale for rating "activity-withdrawal" in, by P. H. Venables, 197

Schmidt, K. E., Combined treatment with chlorpromazine and reserpine, 200
Segal, L. J., and Tansley, A. E., A clinical trial with hydroxyzine (Atarax) on a group of maladjusted subnormal children, 677
Senile deterioration, prognosis in, by W. McAdam and R. A. Robinson, 821
,, psychotics, learning and memory function in, by J. Inglis, 796
,, ,, parentrovite in the treatment of, by J. A. Krawiecki, 601
Serotonin and acetylcholine in the spinal fluid. Sachs, E., jr. (E.), 687
Sessions Hodge, R., and Golla, F. L., Control of petit mal by acetazolamide, 214
Sexual behaviour of young criminals, by T. C. N. Gibbens, 527
Shapiro, M. B., *et al.*, An enquiry into the determinants of a differentiation between elderly "organic" and "non-organic" psychiatric patients on the Bender-Gestalt Test, 364
Shatin, L., The influence of rhythmic drumbeat stimuli upon the pulse rate and general activity of long-term schizophrenics, 172
Simpson, R. W., The effects of Pacatal on chronic mental illness, 610
Somatotypes, the Rees-Eysenck index of, by R. W. Parnell, 209
Speech, the third element in: prosody in the psychiatric clinic, by G. H. Monrad-Krohn, 326
Stern, J., and Lewis, W. H. P., Serum proteins in Mongolism, 222
Stressors, a hierarchy of, by R. Fischer and N. Agnew, 858

Tait, A. C., *et al.*, Initial psychiatric illness in involutional women, I, 132
,, ,, Initial psychiatric illness in involutional women, III, 824
Tansley, A. E., and Segal, L. J., A clinical trial with hydroxyzine (atarax) on a group of maladjusted subnormal children, 677
Temporal lobe, patterns of cognitive test performance as functions of the lateral localization of cerebral abnormalities in the, by V. Meyer and H. Gwynne Jones, 758
,, lobectomy in epilepsy, personality changes following, by D. Hill, *et al.*, 18
,, ,, with removal of uncus, hippocampus and amygdala. Morris, A. A. (E.), 425
,, neocortex in macaca mulatta, subcortical projections from the. Whitlock, D. G., and Nauta, W. J. H. (E.), 880
,, regions, face and jaw movements during epileptiform discharge in. Baldwin, M., *et al.* (E.), 887
Tewfik, G. I., and Wells, B. G., The use of Arfonad for the alleviation of cardio-vascular stress following E.C.T., 636
Thalamo-striate relations in the monkey, a study of. Powell, T. P. S., and Cowan, W. M. (E.), 292
Time sense, the. Lhamon, W. T., and Goldstone, S. (E.), 683
Tranquillizing drugs, some observations on the use of. Szasz, T. S. (E.), 866
Tranquillizers in mental deficiency, by M. Craft, 855
,, *See also* drug therapy, atarax, ataractic drugs, pacatal, meprobamate, methylpentynol, chlorpromazine, reserpine, frenquel
Treatment of mental illness, aim and method in, by W. Sargant, 699
Trouton, D. S., *et al.*, Drugs and personality. II, 645
,, Drugs and personality. III, 650
,, Placebos and their psychological effects, 344
,, *et al.*, Drugs and personality. IV, 656

Ultrasonically produced changes in the blood-brain barrier. Bakay, L. (E.), 425

Van Gogh, Vincent, the psychological development of, by A. J. Westerman Holstijn, 1
Vaughan, G. F., and Leiberman, D. M., The use of some new pharmacological agents in psychiatry, 110
Venables, P. H., A short scale for rating "activity-withdrawal" in schizophrenics, 197
Visual imagery, the control of, in mental disorder, by C. G. Costello, 840
,, ,, the relationships between some aspects of, and the alpha rhythm, by C. G. Costello and P. McGregor, 786
Vitamin therapy, efficacy of parentrovite in senile psychotics, by L. Couper, *et al.*, 601

Walton, D., A further experimental study of using perceptual errors as an aid to diagnosis, 556
,, *et al.*, Meprobamate in the treatment of tension states, 581
,, ,, The efficacy of parentrovite in the treatment of a group of senile psychotics, 601
Watt, D. C., Review of From Custodial to Therapeutic Patient Care in Mental Hospitals (R.), 418
Weckowicz, T. E., Size constancy in schizophrenic patients, 475
Wells, B. G., and Tewfik, G. I., The use of Arfonad for the alleviation of cardio-vascular stress following E.C.T., 636
Westerman Holstijn, A. J., The psychological development of Vincent van Gogh, 1
Whitelaw, J. D. A., and Sandison, R. A., Further studies in the therapeutic value of L.S.D.-25 in mental illness, 332
Wolff, S., Folie à trois, 355

PART II.—AUTHORS REFERRED TO IN THE EPITOME

Adams, C. L., 868
Adey, W. R., 427
Anand, B. K., 437
Arieti, S., 435
Arnold, A. L., 423

Bakay, L., 425
Baldwin, M., 887
Bercel, N. A., 289, 289
Birzis, L., 884
Blomstrand, R., 440
Bonafede, V. I., 868
Bones, H. A., 682
Brace, D., 888
Bradley, P. B., 872
Bridger, W. H., 422
Brookhart, J. M., 293
Burns, B. D., 885

Carey, B., 682
Carpenter, M. B., 685
Chao, D., 887
Clark, L. D., 884
Cline, H. S., 425
Cowan, W. M., 292

Delgado, J. M. R., 293
Denber, H. C. B., 884
Druckman, R., 887
Dua, S., 437

Ehrentheil, O. F., 867
Elkes, J., 872
Ellingson, R. J., 434
Eysenck, S. B. G., 439

Fabing, H. D., 422
Feuss, C. D., 874
Folch, J., 866
Fraser, H. F., 423
Freeman, H., 423, 425
Frontera, J. G., 879

Gantt, W. H., 422
Garrett, E. S., 867
Gauthier, C., 437
Gloor, P., 868
Goldstone, S., 683
Gragg, L., jun., 874

Hamlin, H., 293
Hamny, T. P., 686
Hemingway, A., 884
Higgins, J. W., 424
Hill, H. E., 866
Hinkle, L. E., 290
Hoch, P. H., 888
Hoeff, H. G., 290

Isbell, H., 423, 425

Kehoe, M. J., 434
Kinross-Wright, V., 683

Lassen, N. A., 867
Leach, B. E., 683
Lewin, W., 872
Lhamon, W. T., 683
Liebert, R. S., 867
Lipcon, H. H., 423
Löfgren, F., 440

Madow, L., 422
Malitz, S., 682, 888
Martens, S., 683
Mason Browne, N. L., 296
McDonald, R. E., 289
McGaughran, L. S., 877
Medina, R. F., 866
Merlis, S., 884
Meyer, J. S., 875
Miller, P. N., 867
Mikisztal, M. W., 883
Moran, L. J., 877
Morris, A. A., 425
Moss, M. L., 879
Moyer, J. H., 683
Myers, J. M., jun., 435

Nauta, W. J. H., 880
Neff, W. D., 686
Newbold, H. L., 434
Noback, C. R., 879
Norman, R. M., 872

Parsons, O. A., 867
Peele, T. L., 885
Persky, H., 425
Persson, I., 419, 424
Piekenbrock, T. C., 683
Pierce, C. M., 423
Pollard, J. C., 434
Porter, H., 866
Powell, T. P. S., 292

Riegelhaupt, L. M., 435
Roth, M., 293

Sachs, E., jun., 687
Sainz, A. A., 888
Sawyer, C. H., 868
Schuster, D. B., 293
Schwarz, B. E., 289
Shagass, C., 875
Shealy, C. N., 885
Sisson, B. D., 434
Slager, U. T., 436
Steed, W. D., 434
Stevens, J. R., 868
Strich, S. J., 297
Szasz, T. S., 866

Tarlov, I. M., 888
Teuber, H.-L., 424
Tokizane, T., 868
Truitt, E. B., jr., 889

Wagner, J. A., 436
Weiner, H., 293
Weinstein, S., 424
Welti, W., 425
Whitlock, D. G., 880
Whitty, C. W. M., 872

Zanchetti, A., 293

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CONTENTS FOR JANUARY, 1957

PAGE

Original Articles—

The Psychological Development of Vincent van Gogh; by *A. J. Westerman Holstijn, M.D.* 1

Personality Changes Following Temporal Lobectomy for Epilepsy; by *Denis Hill, M.B., B.S., F.R.C.P., D.P.M., D. A. Pond., M.A., M.D., M.R.C.P., D.P.M., W. Mitchell, and M. A. Falconer, M.Ch., F.R.C.S., F.R.A.C.S.* 18

Abilities and Behaviour of Epileptic Children; by *H. Halstead, M.A., Ph.D.* . . . 28

Night Vision and Psychiatric Disorders: A Review of Experimental Studies; by *G. W. Granger* 48

Critique of Psychological Approaches to Brain Damage; by *Victor Meyer, B.A., Dip.Psych.* 80

The Use of Some New Pharmacological Agents in Psychiatry; by *D. M. Leiberman, M.D.(Leeds), M.R.C.P.(London), D.P.M., and G. F. Vaughan, M.B., M.R.C.P. (London), D.P.M.* 110

Drugs and Personality; by *H. J. Eysenck, Ph.D.*
I. Theory and Methodology 119

Initial Psychiatric Illness in Involutional Women; by *A. C. Tait, M.B., D.P.H., D.P.M., J. Harper*, M.B.E., *M.B., M.R.C.P.E., D.P.M., and W. T. McClatchey, M.D., D.P.M.*
I. Clinical Aspects 132

A Survey of Chronic Patients in a Mental Hospital; by *K. W. Cross, B.Sc., Ph.D., J. A. Harrington, M.D., D.P.M., and W. Mayer-Gross, M.D., F.R.C.P.* 146

The Influence of Rhythmic Drumbeat Stimuli Upon the Pulse Rate and General Activity of Long-term Schizophrenic; by *Leo Shatin, B.A., Ph.D.* 172

Experimental Method in Clinical Psychological Practice; by *R. W. Payne, B.A., Ph.D.* 189

A Short Scale for Rating "Activity-Withdrawal" in Schizophrenics; by *P. H. Venables, Ph.D.* 197

Combined Treatment with Chlorpromazine and Reserpine: by *K. E. Schmidt, M.D., M.R.C.S., L.R.C.P.* 200

The Rees-Eysenck Body Index of Individual Somatotypes; by *R. W. Parnell, D.M., M.R.C.P.* 209

Control of Petit Mal by Acetazolamide; by *F. L. Golla, F.R.C.P., and R. Sessions Hodge, M.R.C.S., L.R.C.P., D.P.M.* 214

A Controlled Clinical Trial of Methylpentynol ("Oblivon"); by *S. Bockner, M.R.C.S., L.R.C.P., D.P.M.* 218

Serum Proteins in Mongolism; by *J. Stern, B.Sc., Ph.D., and W. H. P. Lewis, A.I.M.L.T.* 222

Initial Psychiatric Illness in Involutional Women; by *J. E. Orme, B.A.*
II. Psychological Aspects 227

The Endocrine Concomitants of Schizophrenia; by *J. C. Batt, M.D., M.R.C.P., D.P.M., W. W. Kay, M.Sc., M.B., Ch.B., F.R.I.C., M. Reiss, M.D., D.Sc., and The late Dalton E. Sands, F.R.C.P.(Edin.), D.P.M.* 240

Biochemical Studies in Electric Convulsive Therapy; by *K. N. Gour, M.D., M.R.C.P.Ed., F.R.F.P.S.G., D.C.H., D.P.H., and S. P. Bhargava* 257

Recovery Time from Modified and Unmodified E.C.T.; by *A. F. M. Little, M.B., B.S., D.A., and A. Arnaud Reid, M.B., B.S., M.R.C.P., D.P.M.* 270

Study of Calcium Metabolism in Electric Convulsive Therapy (E.C.T.) in Certain Mental Diseases; by *K. N. Gour, M.D., M.R.C.P.Ed., F.R.F.P.S.G., D.C.H., D.P.H., and H. M. Chaudhry, M.B., B.S.* 275

Reviews 286

Bibliography and Epitome 288

Supplement

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